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AUTOMOTIVE INDUSTRIES
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VOL. XLVIII NEW YORK—THURSDAY, JANUARY 18, 1923 No. 3

Engineers Discuss Many Timely Problems at Winter Meeting

Next winter session to be in West, summer meeting in East. Meeting just closed developed discussion of steering gears, detonation, fuel, airplane design, body construction, and research. New all-fabric body described. Attendance over 500. Elisha Lee in dinner speech, asks railroad and motor vehicle cooperation.

By Norman G. Shidle

THE next winter meeting of the Society of Automotive Engineers will be held somewhere in the Middle West at a time not conflicting with the New York Show. The summer meeting will be held in the East. These were two important announcements made at the annual meeting of the society held in New York Jan. 9-12. More than 500 members attended the sessions at which they discussed engineering topics ranging from body construction and painting to fuel and engine cooling.

Elisha Lee, vice-president of the Pennsylvania Railroad, speaking at the dinner held Jan. 11, gave to the industry the most important general message that came from the meeting. Lee showed the necessity for cooperation between railroad and motor transport interests and emphasized the need for open-mindedness on the part of both in approaching their mutual problems. His own ideas as expressed to the engineers were characterized by a clarity of analysis and a breadth of vision which indicated his willingness to practise what he preaches.

The trend of his thought is well illustrated by the following statement: "Motor vehicles and concrete highways are destined to add very greatly to the utility and efficiency of railroads by rounding out and completing rail service, and relieving the railroads of certain forms of service which are burdensome and costly when performed over fixed tracks and with the necessarily heavy equipment of the steam lines, but can be made attractively profitable to the loose-footed, free-moving motor car. This is the aspect of the matter toward which, in my opinion, both the motor industry and the railroads, in their own true interests and in the interest of transportation progress, should endeavor to guide public thought and discussion." Lee's address is printed in full on later pages of this issue.

FEATURES of the technical sessions included a lively discussion of wheel wobble and steering systems in general, a complete description of a new all-fabric closed body, practical illustrations of finishing-varnish test methods, a complete technical discussion of airplane engine practice as applied to air-cooled passenger car engines and returning the report on metric thrust ball bearings to the Ball and Roller Bearings Division of the Standards Committee.

Nearly every session had an attendance of at least seventy-five, while the number at some of the discussions ran well over one hundred. Marked interest in nearly every topic was displayed by those attending the sessions. Discussion was spirited and in most

Col. H. W. Alden, president of the S. A. E. for 1923

B. B. Bachman, retiring president, heads Highways Committee for 1923

cases was going full blast when the chairman found it necessary to close the meeting because of lack of time.

The extension of recommended practice on front hubs to cover passenger cars, as well as trucks, was a major Standards Committee accomplishment.

The all-fabric closed body described by George Mercer in his paper on "Cheaper Closed Body Construction" was probably the most novel and distinctive engineering idea brought out during the session. This body consists of a wire-covered wood frame on which are applied a layer of heavy buckram and a covering of highly finished fabric. Discussion on Herbert Chase's paper about modern steering gear design emphasized the divergence of opinion that still exists concerning wheel wobble and kindred steering gear problems. The paper was important chiefly as giving a comprehensive survey of steering gear practice as it now exists which should serve as an excellent starting point for further detailed study of this important design topic.

While nothing of a sensational character was developed by the meeting as a whole, there was an exchange of constructive, practical information in practically every session.

President Henry W. Alden, in his inaugural address, made five statements of immediate importance concerning the society. They were as follow:

1. **The next winter meeting will not be held at Show time in New York, but will be held on some other date in the Middle West.**
2. **The next summer meeting will be held in the East either in the mountains or at the seashore, probably the latter.**
3. **A new plan has been adopted for strengthening the section activities. Considerable attention will be given to this phase of the Society's program during the coming year.**
4. **The Highway Committee of the S. A. E. is now ready to function actively. Its work and scope have been determined, and it is ready to go ahead in a constructive way. Its chairman during the coming year will be the retiring president, B. B. Bachman.**
5. **Emphasis will be laid upon production engineering during 1923. The success of the Detroit Production Meeting last fall showed the need for such activities on the part of the society. Design and production work are to be tied together more closely.**

At least one business session will be held in New York next year at the time of the New York Show, in addition to the regular winter meeting which will be in the West. There is some thought of holding a single technical session at the New York meeting at which some very prominent foreign engineer may be asked to speak. Such a plan is not definite at this time, but has been suggested.

The attendance at the S. A. E. dinner was about 1150. The festivities were held at the Hotel Pennsylvania and C. F. Kettering again acted as toastmaster.

Steering Systems Paper Results in Lively Discussion

Wheel wobble can occur without lost motion. Use of anti-friction bearings on knuckle spindles not universally favored. One speaker advocates use of shackle on front instead of rear end of front spring

By P. M. Heldt

THE paper by Herbert Chase, entitled "A Critical Study of Modern Automotive Vehicle Steering Systems" has been printed in full in AUTOMOTIVE INDUSTRIES of Dec. 28 and Jan. 4.

It summarized the views of a number of prominent automobile engineers on various features of steering system design and construction.

The causes of hard steering, angular position and correct location of knuckle pivots, foregather and undergather of wheels, castering, wheel wobble and draglink location were among the subjects dealt with in detail.

This paper was the subject of a lively discussion, for one reason because it raised the question of the cause of wheel wobble, concerning which each speaker seemed to have his own theory. C. T. Myers read parts of an article on the subject which, he said, was based upon the discussion of wheel wobble, which had been prepared for AUTOMOTIVE INDUSTRIES by A. Ludlow Clayden last fall. In this he gave it as his opinion that from the standpoint of safety in operation the brakes came first and the steering gear second. The logic of this order was later challenged by M. C. Horine, who asked Myers whether, when driving in congested traffic he would rather have the steering gear go wrong than the brakes. Myers said there are three possible causes of wobble. The first is that under the action of the front springs the ball on the knuckle arm tends to describe a certain arc and the corresponding socket on the drag link another, whereas the actual paths of motion of the two must be the same. Under certain speed and road conditions this will produce wobble. The second cause is looseness or play in the steering mechanism and connections. It has been observed, said Myers, that wobble is greatest when there is considerable lost motion in the steering parts. He

compared the phenomenon to that of snapping a link chain back and forth like a whip, and said that if the engine were at all loose on the frame it acts in a manner similar to a weight on the end of the chain, thus increasing the shock. The third cause is lack of balance of the wheels.

When a series of road bumps is encountered at a rate forming some harmonic of the natural vibration period of the front end of the chassis, the latter will "shimmy," said Myers, and added that unbalanced forces due to the tire valves, if assisted by other causes, can start "shimmying." The phenomenon is also a function of the character of the road and the speed of the car. With a certain car, for instance, "shimmying" occurred at 12-20 m.p.h. on rough roads and at 30 m.p.h. on smooth roads. Driving on the right side of the crown of the road has a tendency to eliminate "shimmying," and if it has started it can sometimes be checked by turning the front end of the car steadily and not too sharply to the left, across the road.

Wheel Wobble Discussion

Myers expressed doubt concerning the validity of Clayden's explanation that the trailer effect or rearward inclination of the steering knuckle pin causes wobble. When only the right wheel encounters a series of road waves there is no wobble. He recommends the use of a liberal size of widely spaced knuckle pin bearings.

E. P. Warner said that there is danger of the influence of looseness in the steering gear connections being overemphasized. The most violent cases of wobble occur with motorcycles, the steering gears of which are rigid. If such a case of wobble occurs at high speeds it usually ends in a fall for the rider. In at least three cases he knows about the tendency to wobble has been eliminated by changing the castering effect.

Horine raised the question whether the use of an antifriction bearing on the knuckle pin is a good thing. He said there is a tendency for the rollers and balls, if they have an oscillating instead of a rotary motion, to embed themselves in their races. He also believes that center steering, instead of making steering easier, makes it more difficult. He said that the mystery concerning foregather seems to exist only in the automotive industry, as carriage builders know well the reasons for foregather and the rules by which it should be determined. One thing that sometimes leads to poor steering in trucks, he said, is that the same front axle is used for trucks of different lengths of wheelbase and, if the angle of the knuckle arms is not changed, the axle cannot possibly be correct for the diñerent wheelbases.

O. A. Malychevich said that the angle between the knuckle arm for the drag link and the knuckle arm for the tie rod should be a right angle. He said that the steering gear lay-out employed on the Schneider omnibuses in use in Paris has proved very satisfactory, the testimony of the drivers being that with these buses there is never any tendency to wheel wobble.

O. M. Burkhardt said that the fact that there is no moment arm in a center point steering gear might be a disadvantage instead of an advantage from the standpoint of wobble, for although an obstruction hitting the wheel near its point of ground contact does not act through any appreciable lever arm, the resisting moment of the opposite wheel is also reduced to zero. He agreed with Myers as to the advantage of liberal size knuckle pin bearings and pointed out that a knuckle of the so-called Lemoine or inverted Lemoine type has the disadvantage that the bearing closest to the spindle is subjected to extreme load in case of side shocks, owing to the fact that the load overhangs the bearing, the same as in a bevel pinion.

A. J. Scaife said that Chase had emphasized the advantages of the ball and socket type of joint in the tie rod. One disadvantage of such joints is that in use the ball does not retain its spherical shape, so that if properly adjusted while in the straight ahead or central position it will cramp if moved over to the extreme position one way or the other. Ball and roller bearings in the steering knuckle, Scaife said, will pit, but even then they will have less friction than plain bushings. Extreme wobble is encountered in cases where there is much play in the steering gear. Wobble was cured in one case by inserting a wedge under the front spring, thus changing the caster angle.

Pomeroy's Opinion

L. H. Pomeroy said that in the De Dion cars the front springs are shackled at the forward end, and that this is an excellent means of reducing the divergence between the arcs described by the knuckle arm ball moving around the fixed end of the front spring and the drag link socket moving around the end of the steering gear lever. In one of the earlier cars of his design the centers of the knuckle arms produced intersected the chassis center line at 0.52 of the length of the wheelbase from the front end. This gave trouble from unsteadiness in the steering, but the trouble was eliminated by making the distance equal to 0.62 of the wheelbase. He thought that there were five contributing causes of wobble and that two or more had to be present in order to produce the phenomenon. He spoke of an experience in England

A. D. T. Libby, who suggested more steering gear papers in the future

Otto M. Burkhard, prominent in wheel wobble discussion

Herbert Chase, who read paper on steering gear design

where a customer, after taking delivery of a car, complained of wobble and brought the car back to the plant. When it arrived there and Pomeroy drove it the trouble had disappeared. However, when the owner drove the car again it reappeared, and it was finally discovered that the owner had gripped the wheel very tightly, and this seemed to bring on the trouble, since it did not appear when the wheel was loosely held. Another contributing cause was probably the detachable rims which were of considerable weight and might have been slightly out of balance. These detachable rims therefore were replaced with plain clincher rims.

H. C. Dickinson said that wheel wobble is one form of periodic vibration and that the general laws of such vibrations must apply to it. A body set in vibration has a certain free period of vibration, like a pendulum, and will swing in this period until friction damps out the motion. If periodic force is applied in step with the vibration and this force exceeds the friction, the amplitude will increase and cause violent shake in some cases. The imposed force may come from the road or from the arms of the operator.

Chase briefly summed up the discussion, replying to the various questions asked.

"How to Reduce Body Production Costs" Topic of Body Session

All-fabric body description brings numerous questions. Pulsifer shows how practical tests of varnish can be made.

By Norman G. Shidle

THE two body sessions presented a study in opposites. At the first one L. Valentine Pulsifer told the engineers how to test and make paint that will stay on a body, while at the second George Mercer told them how to build a body without using paint. Both papers brought out some very new and very practical ideas, suitable for immediate application in current automobile body building practice.

Methods of testing leather substitutes were discussed by J. B. Davis and conservation of hardwood lumber by F. F. Murray.

That body engineers in general are concentrating their attention upon reduction in cost, is apparent from opinions expressed in all of the papers as well as from statements in discussion. To get the best results at the lowest cost, full cooperation will be necessary between chassis and body designers. This point was mentioned in talking about several different phases of body practice.

Dealing chiefly with a new all-fabric body, Mercer's paper on "Cheaper Closed Body Construction" enumerated eight steps marking the major developments in closed body construction.

Beginning with the all-wood body which characterized the immediate post-carriage days and ending with a fabric covered wood-frame body, built in a practical way for the first time only a few weeks ago, the development of closed body design and manufacture presents some practical lessons upon which to base future progress.

Mercer described specifically the new body which he has recently built which consists of a surface entirely covered with fabric over a foundation of wire and buckram fastened to the conventional wood framing. This body was discussed briefly in AUTOMOTIVE INDUSTRIES last week.

The eight phases of body building development outlined by Mercer were:

1. The all-wood body, similar to the old carriage.
2. Substitution of sheet aluminum for wood panels.
3. Adoption of sheet steel panels.
4. Improvement in stamping and drawing operations, permitting more effective use of sheet metal.
5. Development of the all-metal body.
6. Simplification of design, through straighter lines, conservatism in rounded corners and curves, reduction in number of moldings, etc.
7. Consideration of body made in small sections, suitable for shipping in knocked down shape.
8. Development of an all-fabric covered body mounted on wooden framework.

This outline of development as given by Mercer presents an interesting summary of progress and trends in closed body practice. The various stages of development are not distinct, of course, and every style of body mentioned is likely to continue in modified form indefinitely. The development traced is chiefly one of ideas, the seventh and eighth mentioned being still in the experimental stage. The types developed during the first six stages have all proved successful and have taken an established place in

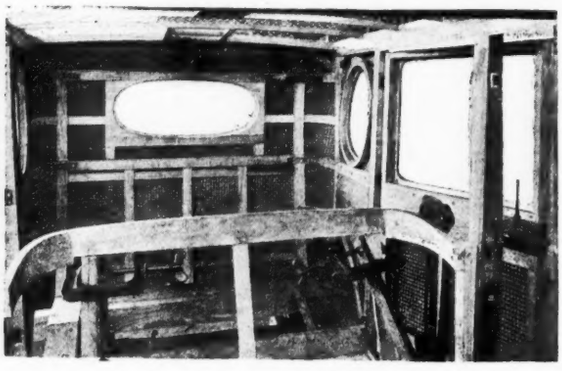


Fig. 1—Interior of all-fabric body

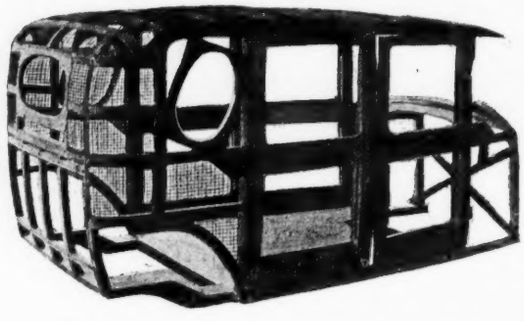


Fig. 2—Frame to which wire is applied

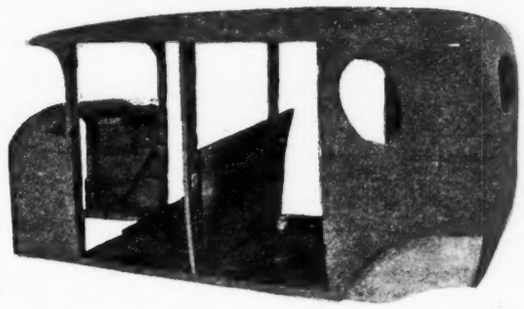


Fig. 3—Body after buckram has been applied

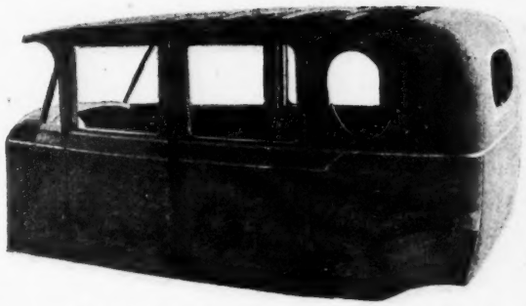


Fig. 4—Finished body ready for application of fabric

current practice, each being suitable for certain specific requirements.

Discussing the new fabric body, Mercer said in part:

The illustrations presented show the progressive steps in making this experimental body. The application of this principle to conventional design is now under way and we expect to be as successful as we have with this sample of expensive design coachwork. This experimental body was planned and built complete in six weeks.

Figs. 1 and 2 show the application of the wire to the framework. This wire is a No. 19, two mesh—that is, two meshes to the inch—and is fastened with staples. Fig. 3 shows the buckram fastened over the wire. One layer of cotton wadding is placed between the wire and buckram. The framework is double rabbetted: there is one rabbet for the wire, one for the buckram. The latter is wider so as to have the latter cross the joint and be nailed beyond the wire edge. Fig. 4 is a view of the completed body. while Fig. 5 shows a cross section of the construction features of the body. It will be noted that the door window openings have rounded corners. This is necessary to allow the fabric to be carried over and fastened to the inside without cutting the goods. This practice was followed in building this experimental body.

As to this form of construction from the practical point of view, let us first consider appearance. We know that the most expensive bodies, those that are made for the highest priced trade, have the top, upper back and rear side quarters of leather. We can remember that in the carriage days the leather Victoria top added a charm to the body design that has never been equalled. The high finished, long grain landau leather used always imparts or rather adds a satisfying finish to the body.

George J. Mercer, whose paper described a new all-fabric body

These comparative statements regarding leather, of course, refer to the conventional form of using same, in which part of the body is painted, while the type of body considered more especially in this paper is entirely covered with a fabric that is a perfect duplicate of landau leather. It will, of course, be necessary to sell the public on the idea before its extensive application can be realized.

Durability is an important point to be considered in comparing this new body with those of more usual construction. Experimental parts of this new design which have stood the test of all weathers for two years are still in daily use and the foundation of the coating is so well preserved that a little friction with a soft cloth will brighten it again almost like new. A fabric body can be kept looking fit much more easily than a paint surface. Time will be necessary to prove that the fabric body can be made to stand up with average use, but we are convinced that this type of fabric construction possesses excellent wearing qualities.

The weight of a body made as illustrated is slightly less than that of an aluminum panel job. The weight of the combined wire, buckram and fabric is under ¾ lb. per sq. ft. The size of the wood framing is the same as for aluminum or steel construction. The steel body braces, the doors, roof and windshield are also the same. In designing we did not make any addition to the construction above that required for the conventional light weight metal paneled body and we are confident that we have produced a serviceable body.

The flat cost of the covering and foundation material on this simple body was 26 cents per sq. ft. Aluminum costs 30 cents per sq. ft. and steel 7 cents. To the cost of both these sheet metals must be added stamping or hammer costs as well as finishing and painting. The work of designing mill work and framing is the same as for the ordinary body but a great saving is gained in finishing. Two men finished complete the exterior and interior on this special body in two weeks and one holiday came in this time. The entire outer surface work was finished first. I realized during the time of completing the work how different the conditions would have been had this body been made with a painted surface. At no time was it necessary to admonish the workmen to keep their hands off of finished surfaces and no special attention was required to protect the fabric surface. Had the surface been painted, care of the finish would have been a prime necessity. Even when this body was put in the freight car for transportation, it was not covered. If this form of construction has no other merit than that of having a surface that is rugged and that does not deteriorate from indelicate handling, it cannot fail to win its way into general use.

There is one other commercial merit. The time usually needed for painting is saved. One day's labor is ample to cover the exterior of a body with fabric. This represents a gain of from five to eleven days, according to the quality of work involved. This form of construction has the merit of the combination body in that the process is flexible and changes in design can be made without sacrificing expensive jigs and tools for neither jigs nor tools are required. Moreover, the form or shape of the body does not have to be considered because the wire, buckram and fabric can be as easily applied to a rounded surface as to a straight one.

The question naturally comes up as to why this method of making bodies did not come forward earlier. Leather cloth until quite recently has been made only in the semi-dull finish and there was not sufficient lustre when made in the black to please the eye. The high lustre that is now to be obtained will compare favorably with the finest landau leather. Therefore, the psychological moment seems to have arrived to make use of it for body covering. This

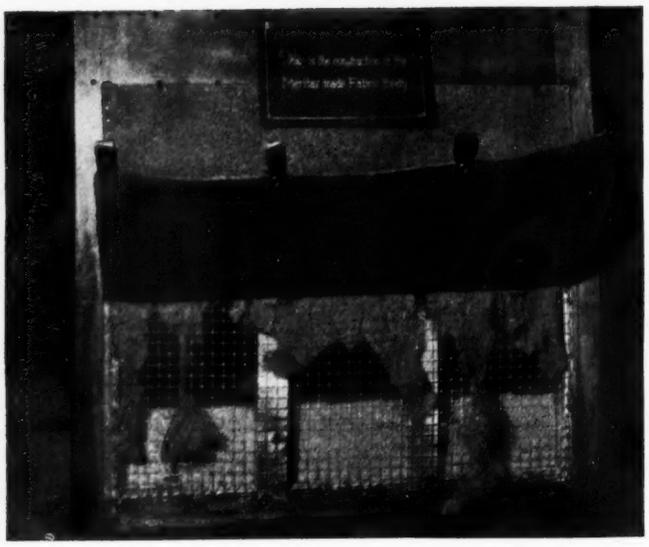


Fig. 5—All-fabric body construction

material will stand more rough usage than a paint surface and will be presentable for two years. It can then be rehabilitated by applying carriage varnish.

In the discussion it appeared that most of the body engineers present consider this new fabric body construction practicable in a general way. Its chief advantage, in the minds of several, is its relative flexibility. The advantage of being able to ship such a body either as a whole or in sections with comparatively little danger of scratching was also recognized.

Mercer's claim that the time ordinarily required for painting and finishing is practically eliminated by the use of this fabric, did not meet with entire agreement. It was pointed out that the time required for enameling an all-metal job is less than that for applying the fabric to the fabric covered job. In medium or high price jobs, or in jobs of any kind where painting is necessary, the time saved through the use of fabric cannot be gainsaid.

George Goddard of the Dodge Co. pointed out, however, that the all-metal body is still in its infancy and that considerable developments can be expected along this line, although many problems still remain to be solved. The upper back panel of the Dodge business coupe and sedan is now made of fabric, for example, although this company expects to have an entirely metal body in the future. The automobile buyer is very favorable toward fabric just now, however, and this enables the Dodge Brothers company to take advantage of the public's desires while developing a suitable method of making the back panel in metal.

G. E. Goddard presided at Body Session

SEVERAL questions were asked Mercer concerning the production characteristics of the material used in his new fabric body. In answering them, Mercer cleared up a number of points.

It is not hard to adapt the wire to round corners, Mercer said. It can simply be pressed into the required shape by hand. Some sort of form over which to work the wire is necessary, of course, but no expensive die is required. One of the chief advantages of this fabric type body, in fact, is the possibility of changing design in production without the necessity of changing expensive dies and tools which must necessarily be changed in some other cases.

There is no bulging between the molding because the material is stretched tight when tacked in place and is so constructed that neither shrinkage nor stretching occurs afterward. The material is tacked under the molding before the molding is applied.

One body engineer asked if a more rigid framework would not be needed with this type of body. He thought that it might tend to loosen up after a year or so. Mercer stated that he did not believe more rigid framework necessary, but that the only way to properly answer that question is to put the body on the road and try it. This is to be done in February, he said, when extensive tests under harsh conditions will be continued until fall.

Repair work can be accomplished just as readily as on metal bodies. The tendency is to build bodies in sections, to trim the sections and then assemble them. This is true of both metal and fabric types. In either case, repair is accomplished by taking out the injured panel and replacing it by a new one.

THERE was some discussion as to the relative merits of various types of molding, some favoring the lead filled type, and some the steel type, with nails spot-welded to its inner surface. Mercer said that a molding formed from the leather fabric folded over a reed had been used to advantage in finishing some bodies, but that a metal molding held in place by screws was used at some joints in the experimental body described in his paper.

L. C. Hill and Chairman Goddard endeavored to encourage a discussion on the general subject of methods tending toward the construction of less expensive closed bodies, but were unable to elicit many comments along this line. One point mentioned in this connection, however, indicated that more rabbets than are really necessary are often used in the construction of doors and door pillars. Simpler construction which is quite satisfactory has been used in some cases.

Some members expressed the view that a more intensive study of methods of producing closed bodies in sections which are later assembled will result in lower production costs. It was agreed also that the elimination of numerous frills which are now used will help in the same direction.

Gardner stated that the farmers are just as much interested in closed cars as are other purchasers, but that it is desirable to so finish some types that they can be used for other purposes than simple passenger carrying. Consequently leather interior trim is sometimes desirable, although on other types mohair velvet is demanded.

G. W. Kerr, in answer to a question concerning construction which tends to obviate drumming noise, said that he had found that soft roofs are better than metal and wood roofs, but are not entirely free from this trouble. Consequently it does not follow that the fabric construction advocated by Mercer will entirely prevent drumming. In some cases it has been found that side panels and even glass windows are responsible for troublesome drumming noise, said Kerr.

Goddard stated that small compartment bodies are sometimes worse than larger bodies in respect to rumble or drumming, and also that a change in the length of muffler tail pipe had in some cases been known to prevent drumming. He added that drumming noises usually result from engine vibration and are apt to be more pronounced on fours and eights than on sixes.

Others pointed out that the method of attaching the body to the frame and in particular the placing of bolts used to attach the body may have considerable influence upon the drumming noises. In two cases mentioned it had been found desirable to place the front body hold

L. S. Keilholtz *A. L. Riker* *A. W. Scarratt* *C. F. Scott* *P. S. Tice*

down bolts 8 or 10 in. back of the dash rather than approximately at the dash. It was said also that when a metal dash is employed it may itself cause a drumming noise, especially if it is not properly stiffened.

Kerr asked whether there are to be any patent restrictions in connection with the use of this new fabric body. Mercer stated that patents are being applied for in the usual way, but that so far as he is aware, the owners of the patents do not intend to limit the manufacture of such bodies except, perhaps, in respect to the make of covering employed. George Goddard expressed the view that it will be difficult to secure controlling patents.

Testing Automobile Finishing Varnish

PULSIFER pointed out that there are three chief qualities that a varnish should have to a high degree and by which it can be judged. These three are elasticity, moisture resistance, and thickness of film. He brought to the meeting considerable testing apparatus and performed actual tests for these various qualities.

For illustrative purposes, Pulsifer considered four types of finishing varnish, all of which are being used in automobile body work at the present time. These he designated *A, B, C* and *D*, respectively, *A* being the lowest grade product. He showed how a service-durability rating can be obtained for each varnish by combining the results of tests for elasticity, moisture resistance, and film factor. This rating as built up for these four varnishes was as follows:

Finishing Varnishes	*A*	*B*	*C*	*D*
Elasticity Factor	10	60	90	160
Moisture Resistance	0	10	20	50
Film Factor	35	47	52	36
Service Durability Rating	45	117	162	246

It will be noted that the durability rating of varnish *A* is to that of varnish *D* as 1 is to 6. One member asked Pulsifer in discussion what the price relation would be. Pulsifer replied that it would be about as 1 is to 2. Thus it would appear that the durability of a varnish job might be increased six times, while the price is only doubled.

Satisfactory shop qualities and service qualities are necessary to a satisfactory varnish. Shop qualities include color, body or viscosity, working, flowing, setting, hardening, fullness and the safety of working.

Service qualities are those which determine the ability of the varnish to give service and include elasticity, resistance to moisture and alkalis, film factor.

Discussing shop qualities Pulsifer said in part:

"To estimate them satisfactorily is easier than to estimate the service qualities of an unknown varnish; and some of the qualities such as working, flowing, setting, hardening and the fullness of finish can be determined best in the shop itself under average shop conditions. By 'working' is meant the possession of the proper working properties for the method of application it is desired to use, whether by brush or by flow coat. By 'flowing' is meant the ability to flow out properly without runs, sags, curtains or brush marks, and yet to retain a suitable body of varnish on the finished surface. By 'setting' is meant the ability to set slowly enough to allow the entire surface to become smooth and yet fast enough to prevent too long a flow, which sometimes permits the varnish to run over a molding or from an upper panel to a lower one. The 'hardening' and 'fullness' are estimated most easily on a body run through on the regular production schedule, but the quality of hardness can also be determined satisfactorily by a laboratory test that duplicates shop drying conditions. The 'safety of working,' that is, the ability of the varnish to act properly under adverse shop conditions, is hardly an important factor in a modern automobile plant.

"The two other shop qualities enumerated above, color and body or viscosity, are best estimated by using the Gardner-Holdt viscometer, an instrument developed in the research laboratory maintained in the City of Washington by the National Varnish Manufacturers' Association. This is a bubble viscometer consisting of a series of twenty tubes standardized as to internal diameter and filled with standardized compounded petroleum oils. These oils vary in color and in viscosity; and each tube, marked *A, B, C, D,* and the like, contains an oil ½ bubble more heavily bodied than the preceding, and a shade darker in color. In ten-tube sets the variation between one tube and the next is one full bubble, which provides close enough gradation in both viscosity and color for the automotive laboratory. It takes a difference of more than one full bubble before the difference in viscosity will become noticeable under shop conditions. Each viscometer is provided with several extra standardized tubes in which are placed the varnishes to be tested.

"The color determination should be made by placing the tube filled with the varnish and the different tubes of the viscometer, one at a time, close together, and looking through them by transmitted light, preferably daylight. If the color of the varnish matches the tube *D*, or is between *C* and *D*, its color can be recorded as *'D'* or *'C-D.'* Other things being equal, the paler a varnish is the better it is, especially when the preservation of the purity of tone of light or brilliant colors is desired. It is convenient to use these same standard tubes of the Gardner-Holdt

viscometer, which in color cover the range of clear automobile varnishes, for reading the color of a given varnish.

"The viscosity is determined by holding the tube containing the varnish and one of the tubes of the viscometer exactly parallel in a vertical position and then rapidly reversing the tubes. When the tube of the set is found in which the rate of travel of the bubble is exactly the same as in the tube of varnish, the viscosity of the varnish is read as, say, F-140 poises, the poises, or measure of absolute viscosity, having been determined for the different tubes of the viscometer. This test should be made carefully to avoid any differences of temperature in the tubes of varnish or oil and the temperature preferably should not vary more than 1 deg. above or below 77 deg. fahr.

Testing Varnish Qualities

"As different methods of application and varying shop conditions and temperatures demand varnishes of different viscosities, the method and the apparatus outlined above are the best and most practical that have been devised.

"The statement that some shop qualities can best be tested in the shop itself should be qualified by saying that if the tests are so made they should be under adequate technical supervision and carefully checked by the engineering department to assure standardized conditions and authentic records. The subject of service qualities falls almost entirely within the laboratory."

Discussing service qualities, Pulsifer said that few people recognize that the chemical rays on sunlight are the prime factors in the destruction of finishing varnish. The surface that gets the sun's rays most nearly perpendicularly will deteriorate first. The effect of this angle of exposure is not commonly understood.

"On the top panels of most hoods," Pulsifer said, "the angle is about the worst possible, the expansion and contraction owing to changes of temperature being more severe and the vibration very much worse than anywhere else on the car.

"A factor contributing largely to this gradual breakdown is moisture or moisture plus alkali, in the form of soap or of mud. The presence of moisture in the varnish-film aids the chemical action of the sun's rays in the final break down of the varnish. The destructive action of alkalis such as mud and soap in connection with varnish is, of course, well known. Abrasion also is a contributing cause of the perishing of the coat of finishing varnish, for the scratches in the surface caused by careless washing or the use of dry washes or polishes when dust or dried mud is on the car, develop eventually into cracks.

"To sum up the causes of the deterioration and eventual destruction of the finishing varnish, we have, first and most important, the chemical action of sunlight, aided by moisture, alkalis, expansion and contraction, vibration and abrasion.

"It is clear that to postpone this final breakdown a varnish should possess as great an initial elasticity, as high a resistance to the destructive chemical effect of moisture and as thick a dried film as are permitted by the method of application and the time schedule."

Pulsifer gave some very practical information about how to test varnishes for their service qualities.

Estimating Elasticity

The elasticity factor can be estimated in the laboratory by the Kauri reduction test and can be actually tested by utilizing a specially constructed machine which pulls the varnish strip apart and records the amount of elasticity in doing so. Pulsifer gave the following instructions concerning the elasticity test:

Place the panel with the varnish side uppermost over a 2-mm. (⅛-in.) rod, held firmly by suitable supports at a point equally distant from the top and the bottom edges of the panel, and bend the panel double rapidly. The varnish should show no cracking at the point of bending. For accurate results the bending of the panel should always be done at 75 deg. fahr., for lowering the temperature will decrease the percentage of reduction that the varnish will stand without cracking; while raising the temperature will increase the reduction.

If the varnish, when tested as outlined in the preceding paragraph, cracks with the 50 per cent reduction specified, make up additional samples reduced with lesser amounts of the standard Kauri solution until a point is reached where it does not crack. If, on the other hand, the varnish does not crack when reduced 50 per cent, prepare other samples reduced with larger amounts of the standard Kauri solution, until the cracking point on subsequent baking and bending is determined.

The panels required for this test are of bright tin, 3 x 5 in., and approximately 0.278 to 0.397 mm. (0.0109 to 0.0117 in.) thick. The weight of the metal per standard base box, 112 sheets 14 x 20-in., Nos. 31 and 30½, United States standard plate gage, is 90 to 100 lb. They should be thoroughly cleaned with benzol immediately before using.

This test, carefully followed out, will enable the varnish testing laboratory to rate the comparative elasticity of a number of unknown varnishes within two working days and with greater accuracy than is possible by the panel weather exposure test, which requires several months. It can also be used for checking the elasticity of deliveries against previous standards. As the elasticity of a varnish is the chief factor in determining its durability, the value of this test, in both time-saving and accuracy, over that of former methods is very great.

Effect of Moisture

"Varnish is affected by moisture in two ways," Pulsifer said, "physically and chemically, and by alkalis, for both the gums, or resins, and the vegetable oils used in making it, are saponifiable in varying degree. The degree in which varnish is affected by moisture and alkalis can be varied within very wide limits, by both the composition and the heat treatment of the varnish during its manufacture. For purposes of comparison, the rate at which different varnishes absorb moisture can be determined with sufficient accuracy by observing the rate at which they turn white or opaque when they are immersed in either hot or cold water. Susceptibility to chemical injury by water can be measured by ascertaining how long they must be subjected to the action of water, either hot or cold, before they become permanently whitened, for permanent whitening indicates a chemical change in the structure of the varnish. Comparative resistance to the destructive action of alkalis can be determined by immersing the varnishes in a standard soap solution for short periods of time, the action of the alkalis on the gums and oils being indicated by loss of lustre and whitening."

He then performed an experiment to determine moisture resistance similar to the one described in the following paragraphs:

For determining the moisture and alkali resistance of a varnish the following method will be found simple and efficient. For the tests use bright tin panels, 3 x 5 in., carefully cleaned with benzol before using. The same panels specified for the Kauri reduction test may be used.

Pour the varnish on three of the panels, place them in a well ventilated room at shop temperature, preferably from 70 to 80 deg. Fahr., out of direct sunlight, and allow them to dry for 48 hr. Place one of the panels in a beaker containing about 2½ in. of distilled water, immersing the end that was uppermost during the drying period, and leave it in the water at room temperature for 18 hr. Remove it and allow it to dry at room temperature for 2 hr. At the end of this period the varnish should show no permanent whitening and not more than a slight dulling. Place the second panel in a

beaker containing about 2½ in. of boiling distilled water, immersing the end that was uppermost during the drying period, and allow it to remain in the boiling water for 15 min. Remove it and allow it to dry at room temperature for 2 hr. At the end of this period the varnish should show no permanent whitening and not more than a slight dulling. If the finishing varnish does not pass these tests it can be rated as poor on moisture resistance. In getting the comparative moisture resistance of a number of varnishes it may be necessary to repeat the tests one or more times. An automobile finishing varnish need not have the high moisture resistance demanded in a spar varnish, but, other features being equal, the finishing varnish showing the highest degree of moisture resistance will remain bright and afford protection for the longest time under the conditions of automobile use.

The third panel mentioned above may be used for testing the resistance to alkalis; in this test a standard soap solution consisting of ½ oz. of Ivory soap dissolved in 1 gal. of distilled water is used. Place the panel in a beaker containing about 2½ in. of the standard soap solution heated to and maintained at a temperature of 120 deg. Fahr. Leave the panel in the hot solution 10 min., remove it and immediately rinse it thoroughly in clear cold tap water, and allow it to dry at room temperature for 1 hr. At the end of this period the varnish should show no whitening and not more than a slight dulling. A finishing varnish failing to pass this test should be rated poor on alkali resistance. In getting the comparative resistance to alkali of a number of varnishes this test may be repeated one or more times, using fresh soap solution each time. While all oil varnishes will finally be destroyed by the action of alkali, other features being equal, the finishing varnish showing the highest degree of resistance to its action will remain bright and afford protection for the longest time under the conditions of automobile use.

A higher resistance to the action of moisture and alkali should be required of a finishing varnish for use on hoods, fenders, wheels and underparts than is required for body use.

Film Factor

The film factor is the final chief factor to be determined in connection with finishing varnish. Pulsifer stated that "by the film factor is meant the normal thickness of the dried film. The durability of a finishing varnish varies almost directly with the thickness of the film, provided, of course, the film is not too thick to harden through properly. In the case of undercoats a thick film is to be avoided, but in the final coat the thicker the better, provided, as said before, it is not too thick to dry and to harden properly. Actual measurements of film thickness involve considerable trouble and are difficult to make accurately. But a sufficiently accurate calculation can be made from data used in the other tests. These data are the viscosity of the varnish, in poises, and the non-volatile content, in per cent. By using the following equation the normal thickness of the dried film can be estimated with surprising accuracy, as has been demonstrated in our laboratory by a large number of check tests.

$$F = \tfrac{1}{2}\ (10V + N)$$

where

F = the film factor in microns
N = the percentage of the non-volatile content
V = the viscosity in poises

For example, a body finishing varnish having a viscosity of 1.40 poises and a non-volatile content of 64 per cent will figure as follows:

$$F = \tfrac{1}{2}\ [(10 \times 1.40) + 64] = 39$$

A 2-ft. square glass panel finished with a normal coat of this particular varnish and measured with the aid of a powerful microscope gave average readings of exactly 39 microns.

This determination of the film factor completes the data on which the service durability of the varnish is to be estimated; next comes the assembling and the intelligent appraising of the data. Here Pulsifer inserted the service durability rating table for four varnishes already presented. Commenting on the difficulty of assembling this test data intelligently into the tabular form, he said: "The four varnishes selected represent, approximately, the minimum and the maximum limits in color, viscosity, non-volatile content, film factor, moisture resistance, elasticity and service durability of the varnishes in current use for finishing automobile bodies.

"The successful comparative rating of varnishes on these data requires careful consideration coupled with experience in varnish testing and research. This is especially true of the resistance to moisture and alkalis. If, however, on the basis of the water and alkali tests outlined above, the varnishes are given moisture resistance factors, a reasonable rating will result for average service conditions. A varnish that stands these tests poorly will receive a 0 rating; fair, 10; good, 20; and very good, 50.

Determining Service Durability

"To determine the comparative service durability ratings of the four varnishes, we add together the figures obtained for each in our tests for elasticity, moisture resistance and film factor."

As previously indicated, discussion brought out the fact that increased durability can be obtained without a proportionate increase in cost. In the table giving service durability ratings of four varnishes, for example, the lowest grade varnish, "*A*," got a total of 45 points, while the highest grade, "*B*," had a total of 246. Thus from a durability standpoint these two varnishes compared about as follows:

$$A{:}D :: 1{:}6$$

Pulsifer stated that "*D*" varnish would probably cost about twice as much as the "*A*" varnish. Thus from a price standpoint they would compare in this way:

$$A{:}D :: 1{:}2$$

Thus it appears that the durability can be increased six times by increasing the cost twice. This is a point that should have careful consideration in every automotive paint department.

Durable finish can be obtained without luster, Pulsifer said, in reply to another question. Paint can be used containing so much pigment that it remains rough and subdues the lustre, or a heavy chassis varnish can be applied and then rubbed down. Two coats of finishing varnish should be used in the later case to get a dull finish as durable as a lustrous finish.

G. W. Kerr asked Pulsifer to explain the cause of rusting underneath the paint coat. Pulsifer stated that rust must be present in incipient form before the paint had been applied, since the paint coat is usually far too strong to permit the penetration of moisture to the metal itself.

The violet ray test for elasticity of varnish was mentioned, but Pulsifer pointed out that this test is still in the experimental stage. He said that it takes more time than the Kauri test and has not proved as satisfactory up to the present time.

Testing Leather Cloth and Fabrics

THE third paper of the body engineering session dealt with the subject "Testing Leather Substitutes and Top Material," and was presented by J. B. Davis of the Standard Textile Products Co. In this paper the author stated that both manufacturers and purchasers of leather cloth and top materials have felt the need of a better method of testing than that involved in weather aging tests, which require several months for completion. Old methods involve considerable guess work

in arriving at conclusions. He stated that his concern had for several months past been cooperating with the Bureau of Standards and the Society for Testing Materials, with a view to formulating tests which would enable rapid measurement of qualities which determine life, durability, and other characteristics of importance.

Davis stated that since the serviceability of leather cloths when subjected to different uses depends upon the manufacturing process used as well as upon the raw materials employed, chemical analyses will, as a rule, not be as useful as physical tests. He then described various physical tests employed, as well as special apparatus used in determining physical qualities, such as weight, resistance to wear, as determined on an abrasion machine developed at the Bureau of Standards, tensile strength and bonding strength as measured by the Scott fabric dynamometer, resistance to puncture and cracking, thickness and toughness of coating, adhesion of coating, resistance to water, as measured by the Mullen water pressure tester, resistance to shrinkage, resistance to fire and heat, cleansibility, and resistance to gasoline, etc. Much that is learned only after months of aging by exposure to the elements can be learned in far less time by exposure to ultra violet light under certain controlled conditions as to moisture, temperature, and the like.

It was brought out in a brief discussion that the strength of the fabric does not depend upon the thread count and weight of fabric alone, but also upon the staple used in making the thread from which it is woven.

Hardwood Lumber Waste

The automotive industry can reduce body production costs and save considerable money by eliminating needless waste of hardwood lumber, Frederick F. Murray pointed out in his paper on "Needless Hardwood Lumber Waste." Much of the difficulty lies in the deficiencies of the present grading system, which was established years ago and which has not been changed to meet current automotive demands.

Revised specifications for grading would better the situation materially. Automotive manufacturers should cooperate with the hardwood producers in simplification and clarification of hardwood standards.

"Both the producer and the consumer of hardwood," Murray said, "would be provided with a simple yardstick measure of lumber values, and the easy application of such standards would do much to remove many of the difficulties that are experienced in interpreting and in the functioning of the present grades." Murray illustrated the possible simplification process by showing the following specifications of No. 1 Commons on the present-grade basis and in the suggested simplified form:

NO. 1 COMMONS

(*Present Grade-Basis*)

Bright sap is no defect in the common grades.

Widths 3 in. and greater, not to exceed 5 per cent of 3-in. widths.

Lengths 4 ft. and greater, but not more than 10 per cent, may be 4, 5, 6 and 7-ft. lengths.

Pieces 4 and 5 ft. long, must be clear.

Pieces 3 and 4 in. wide, 6 and 7 ft. long, must be clear.

Pieces 3 in. wide, 8 to 16 ft. long, must work 66⅔ per cent clear-face in not over two cuttings; no cutting to be less than 3 ft. long by the full width of the piece.

Pieces 4 in. wide, 8 to 16 ft. long, must work 66⅔ per cent clear-face in not over two pieces in cuttings 2 ft. and over long by the full width of the piece.

Pieces 6 ft. long, 5 to 8 in. wide, may have one standard defect; pieces 6 ft. long, 9 in. and over wide, may have two standard defects.

Pieces 5 to 7 in. wide, 7 to 11 ft. long must work 66⅔ per cent clear-face in not over two cuttings; pieces 5 to 7 in. wide, 12 ft. and over long, must work 66⅔ per cent clear-face in not over three cuttings.

Pieces 8 in. and over wide, 7 to 9 ft. long, must work 66⅔ per cent clear-face in not over two cuttings; pieces 8 in. and over wide, 10 to 13 ft. long, must work 66⅔ per cent clear face in not over three cuttings; pieces 8 in. and over wide, 14 ft. and over long, must work 66⅔ per cent clear-face in not over four cuttings.

No cutting to be considered which is less than 4 in. wide by 2 ft. long, or 3 in. wide by 3 ft. long.

SIMPLIFIED SPECIFICATIONS

(*Suggested as to Form Only*)

Primary Determining Factor.—4 in. and over wide, 48 in. and over long, clear face.

Secondary Determining Factor.—4 in. and over wide, 24 in. and over long, clear-face. Each board must contain not less than 50 per cent primary factor and yield a total of not less than 75 per cent of primary and secondary factors combined.

Engine Cooling Discussed by Heron and Lockwood

Aircraft practice can be applied to automobile engines without greatly increased cost. Lockwood gives test results.

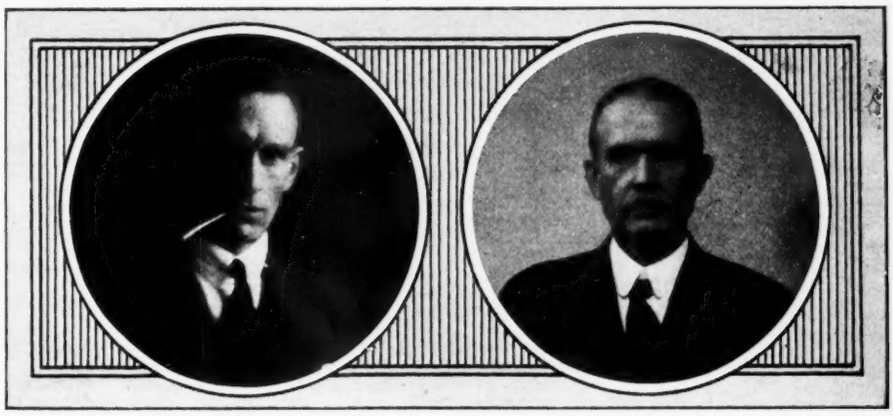
By P. M. Heldt

TWO papers were presented at the session on engine cooling, one by S. D. Heron, aeronautical mechanical engineer of the Air Service, McCook Field, and the other by E. H. Lockwood, assistant professor of mechanical engineering at Yale University. A good deal of interest was shown in both papers, and the session was well attended.

According to Heron, the application of a large part of aircraft practice would not involve greater cost than that of present car practice. Complication and expense do not necessarily spell efficiency, and crudity is not necessarily economy. Much of the crudity seen in air-cooled engines is decidedly very expensive.

For air-cooled as well as for water cooled cylinders the lay-out with overhead inclined valves has proved most efficient as regards output, fuel economy and cooling. Modern air-cooled aircraft engine cylinders are admittedly expensive and apparently complicated, but it is the necessity for minimum weight and sustained high specific output, together with high thermal efficiency, that is responsible for both the expensive built-up construction and the use of high class material.

High-duty air-cooled cylinders can be built of commercial materials throughout. Alloy-steel exhaust-valves are needed, but not more so than in present water-cooled types. A plain cast-iron cylinder-body with an aluminum piston and a chromium-steel exhaust-valve can, with suitable design, be made to cool efficiently and pull b.m.e.p.'s of over 100 lb. per sq. in. for prolonged periods with a full-throttle fuel-consumption of less than 0.6 lb. per b.hp.hr.



S. D. Heron told how aircraft engine practice can be applied to air-cooled car engine design

E. H. Lockwood read a paper on "Cooling Capacity of Automobile Radiators"

The experiments of the Engineering Division have shown that a rounded combustion chamber head is much superior to a flat head. A comparison was made of two cylinders of the same size (5⅝ by 6½ in.) by the same designer, the only other difference being that the flat head engine had four valves in the cylinder head while the rounded head engine had only two. With internally cooled exhaust valves the flat head engine developed a maximum b.m.e.p. of 132 lb. per sq. in. with a fuel consumption of 0.62 lb. per b.hp.hr. The round head engine with ordinary exhaust valve developed 137 lb. per sq. in. max. b.m.e.p. with a fuel consumption of 0.48 lb. per b.hp.hr., with a maximum cylinder head temperature of 450 deg. Fahr. With an internally cooled exhaust valve it has proved possible to run as lean as 0.43 lb. per b.hp.hr. with 123 lb. per sq. in. b.m.e.p.

Recent experience of the Engineering Division has shown that it is not necessary to use four valves per cylinder for engines up to 50 hp. per cylinder, and in air-cooled automobile engines there would be no occasion for using dual valves. The use of exhaust valves larger than the intake valves is absurd, when it is considered that a pressure up to 100 lb. per sq. in. is available for the expulsion of the burnt charge and only 14.7 lb. for filling with fresh charge. It was found that a large angle of valve tilt is best, as it gives the maximum metal space between ports and apparently maximum filling and discharge capacity from a given size of valve. An included angle of 70 deg. has proved satisfactory, although this prevents boring the valve seats and ports from the cylinder mouths, with integral heads.

As regards cylinder material, recent tests by the Engineering Division have shown that in capacities up to 87.5 cu. in. per cylinder cast iron cylinders at continuous full throttle will give cooling, output and fuel economy adequate for automobile purposes. Two designs of air-cooled cylinders with hemispherical heads and valves therein at an angle are shown in the paper, and recommended as good types for automobile use. Objection on the score of difficult machining is anticipated, and it is claimed that if, in a medium priced air-cooled car engine, design is subordinated to production, the result is sure to be unsatisfactory.

It has been found that fairly thick metal is necessary in the walls and fins of a cast iron cylinder. For a 3½-in. bore hemispherical head cast iron cylinder a thickness of ⅝ in. at the center of the combustion chamber, tapering to 7/16 in. at the edge of the chamber and not less than ¼ in. at the lowest fin on the barrel, appears to be suitable. The cooling surface obtainable with finning of the proportions recommended will not vary very much. The B. S. A. cylinder of approximately 3½-in. bore and 3⅜-in. stroke has 4.18 sq. ft. of area in the fin, head, barrel and port surfaces and, at the normal maximum output of 8.5 b.hp. per cylinder, this is equivalent to almost 0.5 sq. ft. per max. b.hp. The larger the cylinder, the lower the cooling surface obtainable per unit capacity becomes.

The author of the paper severely criticizes the usual arrangement of the exhaust valves on automobile engines, which he says have the following defects:

(1) The width of the seat in the cylinder is usually extremely small.
(2) The rim of the valve is often very thin.
(3) A considerable length of the valve-stem is often directly exposed to flame
(4) The length of the valve-guide within the exhaust-port is usually directly exposed to flame, instead of being shrouded by the valve-guide boss.
(5) Valve-stems of very small diameter are often used.
(6) Valve-seats in water-cooled engines are rarely in direct contact with water for the entire circumference of the seat. In many air-cooled engines no attempt is made to circulate air between the intake and exhaust-ports. On the contrary, a wall of solid metal usually joins the two ports at the point of closest proximity.

The characteristics of heat dissipation from finned cylinders have been investigated by Gibson in a wind tunnel, and the results of his findings are as follows:

(1) The heat dissipation is proportional to the difference between the mean temperature of the cooling surfaces and that of the incoming air.
(2) The heat dissipation is proportional to the 0.73 power of the weight of cooling air brought into contact with the cooling surfaces per unit of time. For a pressure type of fan, this sensibly equals $V^{0.75}$, where V is the velocity of the cooling blast.
(3) The discharge of a cooling fan of the propeller or centrifugal type, moving air through a cooling system of the type used on the R. E. F5 engine, is approximately proportional to $N^{0.85}$, where N is the number of revolutions per unit of time.

Thus, as the heat dissipated at a constant mean temperature is proportional to $V^{0.73}$ and V varies as $N^{0.85}$, the heat dissipated will, at constant mean temperature, vary as $N^{0.62}$.

TABLE 1—ENGINE TESTS

Speed, R.P.M.	Power, B.Hp.	Brake Mean Effective Pressure, Lb. per Sq. In.	Fuel Consumption, Lb. per B.Hp-Hr.	Difference between Cylinder Head and Air Temp., Deg. Fahr.	Ratio, Temperature to Brake-Horsepower	Per Cent
1,200	25.4	117.5	0.61	389	15.3	100
1,400	31.0	123.0	0.60	407	13.1	86
1,600	36.9	128.0	0.57	450	12.2	80
1,700	39.5	129.0	0.56	452	11.4	75
1.800	40.9	126.0	0.56	462	11.3	74
1,900	42.1	123.0	0.56	463	11.0	72
2,000	43.1	119.5	0.56	515	12.0	79

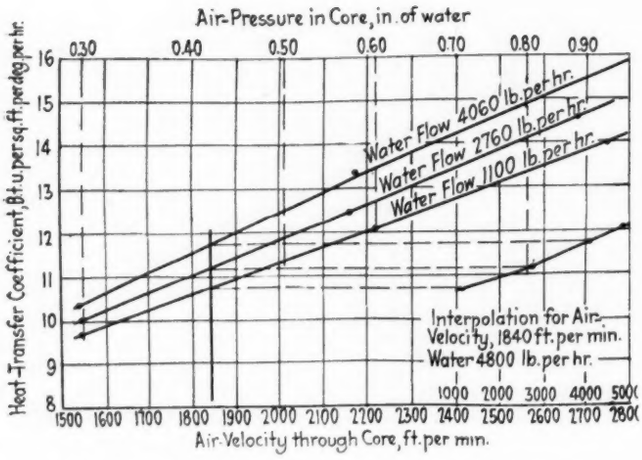


Fig. 1—Heat-transfer coefficients showing the variation produced by changes in the flow of air and water

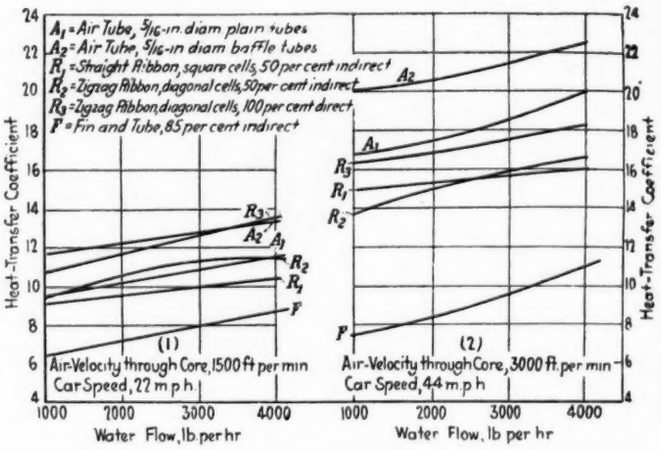

A1 = Air Tube, 5/16-in. diam plain tubes
A2 = Air Tube, 5/16-in. diam baffle tubes
R1 = Straight Ribbon, square cells, 50 per cent indirect
R2 = Zigzag Ribbon, diagonal cells, 50 per cent indirect
R3 = Zigzag Ribbon, diagonal cells, 100 per cent direct
F = Fin and Tube, 85 per cent indirect
Heat-Transfer Coefficient
(1)
Air-Velocity through Core, 1500 ft per min
Car Speed, 22 m.p.h.
(2)
Air-Velocity through Core, 3000 ft. per min
Car Speed, 44 m.p.h.
Water Flow, lb per hr
Water Flow, lb per hr

Fig. 2—Comparative heat-transfer coefficient for different cores

The figures in Table 1 suggest that a fan-cooled engine with an air supply proportional to a fractional power of the engine speed, and arranged so as to keep the maximum cylinder temperature around 400 deg. Fahr. with full throttle at normal engine speed, will not develop excessive cylinder temperatures under the worst conditions. This is in view of the Engineering Division's experience that temperatures hitherto considered excessive can be used without damage, reduction of output or unsatisfactory performance.

On the subject of fan types the following opinions are expressed in the paper: "For passenger-car use, there is much to be said in favor of the propeller type of fan because it can be used in the conventional position, is easy to drive, has, when properly designed, a very high efficiency, does not require any elaborate casing to secure efficiency and, when suitably installed in a phaeton, will have its still-air capacity very considerably augmented by the motion of the car. The propeller type is, however, noisier than the centrifugal type and, when running at very high speeds, is liable to produce an objectionable whine. The propeller type, unless of large diameter or run at very high speed, does not give as high a discharge pressure as the centrifugal type, and is therefore not so suitable where cooling is required at continuous full-power with a slowly moving vehicle."

The Heron paper contained two appendices, one entitled "Experimental Development of Air-Cooled Engine Cylinders," by C. Fayette Taylor, and the other on "Foundry Production of Air-Cooled Cylinders," by E. H. Dix, Jr.

Three Radiator Types

Prof. Lockwood divides radiators into three classes with respect to the core construction, namely, fin and tube, ribbon and air tube. The free air area of all types of core, expressed as a percentage of the total frontal area, varies from 65 to 75, hence is nearly the same for all cores. The capacity of a radiator is closely connected with the total amount of surface exposed to the air currents. A comparison of different types of core on this basis is made in Table 2.

TABLE 2—AVERAGE VALUES OF FREE-AIR AREA AND TOTAL CORE SURFACE

Type of Core	Free-Air Area in Terms of Frontal Area, Per Cent	Direct Surface in Terms of Total Core Surface, Per Cent	Total Core Surface, for 1 Cu. Ft. of Volume, Sq. Ft.
Fin - and - Tube Disc Fins	57	16	110
Fin - and - Tube Continuous Fins	70	15	130
Ribbon Core	65 to 80	50	150 to 175
Ribbon Core	65 to 80	100	125
Air-Tube Core	72	100	110

By direct surface is meant the core surface which is in direct contact with water on one side.

When a radiator is tested, a series of runs is made covering the desired range of air and water velocities, for each of which the heat-transfer coefficient is computed. The radiator performance is then estimated by the aid of the coefficients.

An example of the heat-transfer coefficients for a ribbon core is given in Fig. 1. The coefficients are not constant, but increase with both the water and the air velocities. Similar diagrams have been made for other types of radiator, for each of which values have been interpolated for the same velocities, forming the new diagram shown in Fig. 2.

Six cores have been chosen as fairly representative of the three main types. The effect of high and low air-velocities is clearly shown by the right and the left sides of the diagram. At low air velocity the air-tube and the ribbon cores are about on a par. At high air-velocity the air-tube surface is more effective than the ribbon core. In both cases the fin-and-tube surface is inferior to either of the others.

Fig. 3 suggests several interesting conclusions, which may be stated as follows:

(1) As between ribbon and air-tube cores as classes, there is little to choose for the speeds used in automobile. For low air-velocity, ribbon cores are slightly better. For higher air-velocity the results are about on a par.

(2) The baffles, or dents, used in air-tube cores add materially to the cooling, without increasing the surface or weight.

(3) The straight-walled ribbon core, having small square cells with 50 per cent of indirect surface, cools as well as other ribbon cores with 100-per cent direct surface. This result is partly due to the greater amount of surface possessed by the small cell core, but it also indicates that the indirect surface of this type of core is nearly equal to the direct surface in cooling ability.

(4) The fin-and-tube core has only about three-quarters of the cooling capacity of the best forms of ribbon core of the same size. This is not surprising in view of the large amount of indirect surface contained in the fin-and-tube type.

Prof. Lockwood added some material to his paper as printed, covering the volumes of core found on a large

number of cars of which tests were made at the Laboratory at New Haven. It was found that on seventeen cars with pump circulation and ribbon cores, there was an average of 49 cu. in. of core per horsepower at 25 m.p.h. On eight cars with thermo siphon cooling the average core volume was 55 cu. in. per horsepower at 25 m.p.h. This made the average core volume for all of the thirty-one cars exactly 50 cu. in. per horsepower. The volume of the core per horsepower varied from 41 to 71 cu. in. and it is worthy of note that the car with the 71 cu. in. of core cooled perfectly when being driven for long distances in low gear.

Chairman Litle asked Prof. Lockwood whether he could give any information on radiators for steam cooling, which subject had aroused considerable curiosity of late. A representative of the G. & O. Mfg. Co. was called upon to discuss this question, but he evidently misunderstood it and talked on core types for the condensers of Stanley steam cars. For this purpose he said ⅜-in. tube with a small fin around it had proved the best.

Referring to the Heron paper on Air Cooling, L. H. Pomeroy said that the chief source of trouble in engines was the huge temperature variation, and that freedom from vibration also depended on the temperature. One thing that was highly desirable was that the engine show a quick response to the throttle, and in this connection it must be remembered that the water cooled engine had a thermal flywheel around its cylinders. In cold weather the air-cooled engine was much like the cadaverous individual who is chilled to the bone by the slightest draft.

In the paper apologies were made for the high internal friction of the universal test engine, and he believed that this was due to the high internal temperature, which had a bad effect on the oil film. Internal friction was of the highest importance, even more than a high mean effective pressure.

Starting Difficulties

T. J. Litle said that, speaking of starting on a cold morning, the water cooled engine was surrounded by a regular refrigerating system, and, of course, required a much longer time to heat up. C. P. Grimes, research engineer of the H. H. Franklin Mfg. Co., when called upon to discuss the subject of the paper said that, as representative of the Franklin company, he wanted to testify to a feeling of satisfaction at seeing an additional air-cooled car at the show, produced by an organization with an efficient engineering staff, which would relieve them of some of the burden of educating the public to the advantages of air-cooling. Mr. Heron had told the audience of many things that did not bother the automobile engineer. For instance, the high mean effective pressures of more than 100 lb. per sq. in. were not necessary in automobile work, especially when one considered that it takes only about 3½ hp. to propel an average car at moderate speeds over good roads. He had noted the adverse criticism of the circumferential fin and they realized the advantages of the radial fin in carrying the heat from the head down to the lower part of the cylinder. He agreed with previous speakers that it was very important to keep down the parasitic resistance. In this connection, in a water cooled engine with the atmospheric temperature at 90 deg. there was a rise in the air temperature of only 26 to 29 deg. In the Franklin under similar conditions the temperature rise of the air was 60 deg., or more than twice that in the water-cooled engine, and, consequently, less than half as much air had to be moved in the Franklin, which meant less parasitic resistance. The efficiency of the Sirocco type of fan used on the Franklin was from 65 to 68 per cent, and as the fan was driven directly from the crankshaft there were no belt losses. The efficiency of the fan on water cooled cars

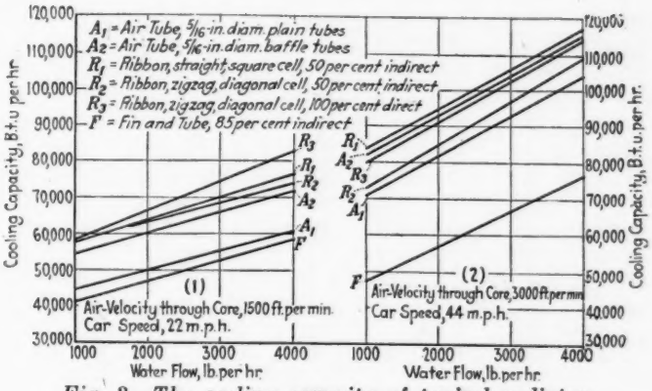

A_1 = Air Tube, 5/16-in. diam. plain tubes
A_2 = Air Tube, 5/16-in. diam. baffle tubes
R_1 = Ribbon, straight, square cell, 50 per cent indirect
R_2 = Ribbon, zigzag, diagonal cell, 50 per cent indirect
R_3 = Ribbon, zigzag, diagonal cell, 100 per cent direct
F = Fin and Tube, 85 per cent indirect
Cooling Capacity, B.t.u. per hr.
Water Flow, lb. per hr.
(1)
Air-Velocity through Core, 1500 ft. per min.
Car Speed, 22 m.p.h.
(2)
Air-Velocity through Core, 3000 ft. per min.
Car Speed, 44 m.p.h.

Fig. 3—The cooling capacity of typical radiator cores

usually was not high, and, besides, they had no pump. He also explained how they overcame the starting difficulty by means of an electric fuel heater.

H. S. McDewell said that research on water cooling had lagged behind research on air cooling. In some cases where aircraft engineering was advertised by car makers as having been applied in their design, he thought the engineers had not gotten close enough to aircraft engineering to profit by it.

It was pointed out in the discussion that in the sleeve valve engine the piston might well attain a somewhat higher temperature, on account of the heat insulating effect of the valve sleeve or sleeves. As regards the exhaust valve, in contrast to what Heron had said, it was possible to use a thin seat and get efficient cooling. The author had failed to mention that all engines, air as well as water-cooled, were oil cooled to quite an extent. The exhaust turbine fan was not a commercial proposition.

Thomas Midgley was called upon to give some information with regard to the experience of the General Motors Co. in developing the so-called copper cooled car. He said that all there was to it was that copper was a better heat conductor than cast iron and therefore was preferable. The temperature of the cylinder was not appreciably higher than that of a water cooled engine, and the brake mean effective pressure was the same as obtained in that type. He thought that many cars were sold by their owners because of the 1/16 in. or so of scale that formed on the outside of the cylinder walls within the jacket and greatly retarded the heat flow to the cooling water. As far as the operation of the engine was concerned, the working parts inside the cylinder did not know what carried the heat away.

Cornelius Myers said that in 1919 he purchased a Franklin car to get a line on its axle design. During the winter of 1919-1920 there were some long spells of very cold weather and it never took more than 30 seconds to start the engine, which had given no trouble at all.

Noise and Vibration

C. Lawrance said that Mr. Pomeroy had spoken of noise and vibration. He could not see why there should be any more noise in an air-cooled than in a water-cooled engine provided the former had a properly designed piston. As to vibration, Mr. Pomeroy probably referred to the more energetic vibration of the molecules inside an air-cooled engine. He thought it only logical to thoroughly cool the top and sides of the combustion chamber, the very parts where the most heat was produced, and said the best testimony to the efficiency of air cooling was the successful practice of some makers to run their engines without any cooling provision on the head whatsoever.

It was brought out in the discussion that the accumulation of filth on the cooling fins does not in any way affect their efficiency.

C. P. Grimes said that they had come to the conclusion that the cylinder wall temperature had practically no effect on the thermal efficiency of the engine. They had made a series of economy runs in which the wall temperature was varied from 190 to 450 deg. Fahr., and the thermal efficiency varied by less than 1 per cent. In this connection S. D. Heron said recent tests at the Engineering Division had shown that the cylinder wall temperatures of air cooled engines did not differ materially from those of a Liberty aircraft engine. The Engineering Division is now investigating the subject of temperatures of water-cooled walls, and has found that they are entirely different from the water temperatures. A layer of lime 1/16 in. thick produces a temperature difference of 130 deg. In regard to the exhaust turbine fan, which had been adversely criticised in the discussion, the Engineering Division now had a design in which the previous faults had been overcome, and especially the excessive temperature of the runner. Called upon for an opinion regarding applied cooling fins of copper, etc., Heron said the integral fin was a better production job, and they had been able to get all the cooling capacity needed with such fins.

Much Test Data Released in Fuel and Research Sessions

Crane summarizes results of joint fuel research. Details of car tests by manufacturers show little difference in mileage with change in volatility in warm weather. Cold weather tests planned.

By Herbert Chase

HENRY M. CRANE, as chairman of the S.A.E. Research Committee, presented an informal report covering the year's work of this committee handled through the Research Department of the Society. One of the most important things accomplished, in Crane's view, was the bringing together of the two great industries concerned with producing the fuel and manufacturing the apparatus in which the bulk of it is consumed. Much had been gained by bringing together the technical men of the two industries in order that each might learn the viewpoint of the other.

As viewed by the automotive engineer, the fuel problem has two distinct phases, said Crane: first, that concerning the kind of fuel which would be most satisfactory if available; second, that concerning the production of such fuel as to yield the greatest number of vehicle miles per barrel of crude, as indicated by tests in actual service.

Practically all of the research conducted to date on behalf of the committee has dealt with the second phase of the problem, since this was considered of greatest importance in view of the large number of cars already in use which could not well be changed to utilize to best advantage a better fuel than is now available, even if such better fuel could be produced in sufficient quantities.

Only Warm Weather Tests to Date

Crane then mentioned the series of tests made at the Bureau of Standards, and those made by car manufacturers using four different grades of fuel provided through arrangement with the fuel refiners. He emphasized the fact that all tests reported upon to date have been made under warm weather conditions, which are presumed to be more favorable to the less volatile fuels than would be tests in colder weather.

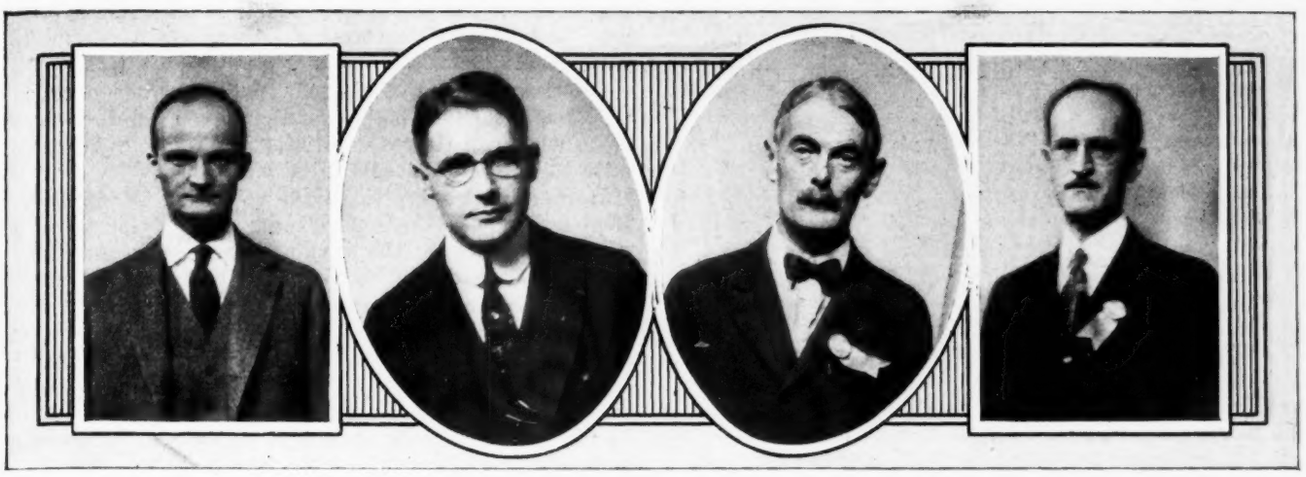
In discussing the tests made by car manufacturers, Crane said that it should be borne in mind that the cars used were mostly of a later vintage than those employed in the Speedway tests conducted by the Bureau of Standards. He indicated further that a careful reading of the report covering the manufacturers' test indicated that the less volatile fuels tested were not so satisfactory as were those with lower average boiling points. He then quoted from a report made by an independent engineer on a Ford car using two fuels, one of which corresponded closely to a comparative volatile aviation gasoline and the other to the average fuel marketed for automobile purposes in New England. These tests indicated that the car accelerated more rapidly with the lighter fuels, when the engine was comparatively cold, and also traveled less miles per gallon under the same conditions. With the engine hot, however, there was less difference in acceleration and no difference in fuel consumption. These tests indicate that the public in general will probably do about as well with the less volatile fuel providing the engine remains at a fairly high temperature in service, and further that if the car is adapted to use satisfactorily the less volatile fuels it will probably not handle the more volatile fuels to any better advantage.

It must not be forgotten, however, that when maximum power and highest economy are desirable without regard to the grade of fuel, the less volatile fuels are invariably selected and give the best results.

Crane indicated that final conclusions concerning fuel volatility cannot be reached until many of the tests already made under summer conditions are repeated in the winter. Some tests under extreme cold weather are desirable not because such conditions are those of average service, but because relatively small changes in temperature may have so little effect as to make the difference unrecognizable.

In respect to dilution of lubricant in the crankcase, which increases as the fuel becomes less volatile, Crane indicated that too much stress had, in his view, been laid upon excessive wear which is supposed to result from such dilution, whereas this wear is often due to other causes. As proof of this view, he said that some cars with well designed pistons and rings had shown practically no wear in eleven years of service. It cannot safely be said that fuel dilution upsets lubrication to such an extent that the use of relatively non-volatile fuels is impossible.

Following Crane's remarks R. E. Carlson of the Bureau of Standards read a report covering the tests of four cars on the Washington Speedway when using the four grades of fuel furnished by Eastern refiners. This report was identical in substance to that presented at the meeting of



Prominent in Research Session

W. S. James *R. E. Carlson* *H. M. Crane* *V. H. Gottschalk*

the American Petroleum Institute about a month ago and summarized in these columns under date of Dec. 14, 1922. It will be recalled that the cars used in this test were selected as representative of at least 75 per cent of all those in use in this country at the time the test was started and that the tests showed practically no difference, so far as warm weather conditions are concerned, in miles per gallon of fuel as between the four fuels used when a maximum power setting was given the carbureter in each case.

Carlson stated that the Bureau is continuing in the altitude chamber at the Bureau tests the purpose of which is to find whether or not there are any conditions of operation, especially in respect to temperature, which require a richer mixture with change in volatility of fuels. In some cases it has been found that more fuel per hour is required at lower engine temperatures, but as yet the tests have not progressed far enough to reach any definite conclusions.

W. S. James of the Bureau of Standards gave a few additional particulars concerning the tests in progress in the altitude chamber, but made no formal report in this regard. He said that some tests made to investigate performance under extreme temperature conditions make it appear that distribution is but little less satisfactory at very low than at very high engine and manifold temperatures, but it is still too early to draw final conclusions in this respect. It may be that a manifold which will handle a gas satisfactorily will also handle liquid fuel as well, but it does not follow that a mixture of the two will give equally good results. Hence intermediate temperatures which are as yet to be investigated may show quite different results.

Tests Made by Car Manufacturers

The concluding report presented at the research session was compiled by V. H. Gottschalk of the S.A.E. Research Department. This report covers tests made by nine representative motor vehicle manufacturers on cars of their own make. Some of these cars were the latest design of the particular manufacturer and some were cars of earlier models. The cars were for the most part owned and driven by officials of the companies concerned, although in some cases they were test cars or service cars belonging to the company. They were selected with a view to being typical of the cars of that particular model in use throughout the country and in most cases were not specially prepared for the test. The tests involved four weeks of operation without special attention or adjustment except as to the carbureter. The 59 cars tested included Buicks, Fords, Overlands, Hupmobiles and Studebakers among several other makes, some of them in the higher priced class.

In these tests four grades of fuel, designated *A*, *B*, *C* and *D*, were used. All of these had an initial boiling point of approximately 100 deg. Fahr. but varied in volatility in much the same way as the fuels used in the Bureau of Standard tests, already referred to, although they were furnished by a Western refiner, while those used at the Bureau were furnished by an Eastern refiner. The end point of the four fuels used were approximately as follows: *A*—400, *B*—435, *C*—463, *D*—500 deg. Fahr.

The cars used were divided into groups of four and each car used each fuel for one week and then changed to another fuel so that at the end of the four weeks it had used each of the four fuels in question. During this period none of the four cars in a given group used the same fuel during the same week. The nine companies cooperating in the test used fifty-five automobiles for 207 separate test periods of one week, the average distance per car being 262 miles.

The average distance traveled per gallon with the various fuels was as follows:

Miles per gallon, gasoline	*A*—14.81	*B*—14.94	*C*—14.70	*D*—14.71
Apparent miles per gallon, lubricating oil	*A*—648	*B*—768	*C*—803	*D*—910

Mileage and Volatility

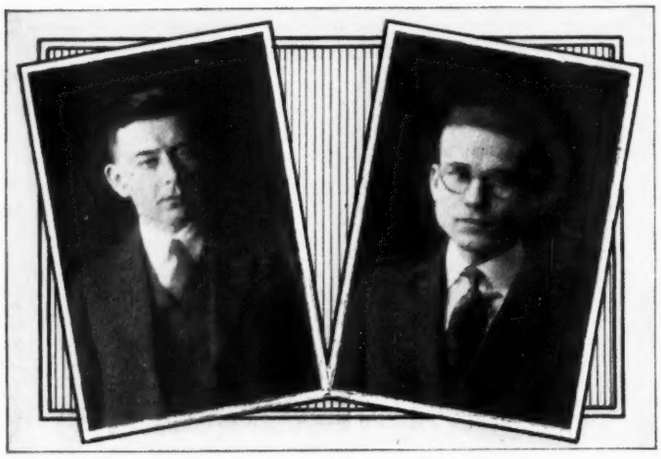
The results obtained indicate that within the degree of accuracy attained the gasoline mileage is not dependent upon the fuel volatility within the range of fuels *A* to *D*, at least under warm weather conditions. This conclusion has been shown to hold to within ±2.6 per cent.

It should be stated that the drivers of the cars tested did not know which of the four fuels they were using at any given time, but that they were requested to give their general impression as to performance with the various fuels used. A summary of their statements in this respect indicated that the drivers preferred the *A* and *B* gasolines; they did not object particularly to the *C* gasoline, but most of them noted difficulty in driving their cars when using grade *D*.

Crankcase dilution increased progressively with decreasing volatility and the rate of increase is more marked for the heavier fuel.

The high crankcase oil dilution, among other things, has indicated the desirability of making further tests under winter conditions.

In presenting the report Gottschalk stated that it is a particularly good example of statistical research as applied to careful observation of service performance.



Read papers at Fuel Session
D. P. Barnard, 4th *C. S. Kegerreis*

A general discussion followed presentation of the foregoing reports, the first speaker being Dr. Van H. Manning, Director of Research of the American Petroleum Institute and former Director of the Bureau of Mines. He emphasized the great value of the cooperation which has resulted from the joint research activity, and paid a tribute to the unbiased attitude of the automotive representatives on the joint research committee.

T. J. Litle of the Lincoln Motor Co. stated that in his view the research had shown that the automobile user can get along with grades of gasoline as poor as that represented by grade *D*, but that they much prefer a less volatile fuel.

F. A. Howard of the Standard Oil Co. of New Jersey frankly admitted that the matter resolves itself into a simple dollars and cents proposition with the oil industry. He indicated that we have passed through periods of resistance to change in quality of gasoline and a period in which effort has been made to substitute information for prejudice. He now fears that we are approaching a period of opposition to change in fuel quality based on a limited knowledge of the facts. He pointed out that the petroleum industry is based upon the shifting sand of uncertain supply of crude oil and that it is undesirable to attempt to impose upon the petroleum industry views concerning the best fuels until all controling factors are taken into consideration.

Another speaker indicated that the fuel problem is purely an economic one—that the refiner wants to be sure as to what constitutes a satisfactory fuel. Some compromise on both sides seems to be inevitable.

Herbert Chase expressed the view that it would be desirable to add to the report submitted by Gottschalk particulars concerning the various cars tested, especially in respect to the design of the manifolds used and method employed in heating them, if any.

The discussion was concluded by H. C. Dickinson, manager of the S.A.E. Research Department, who stated that it is the intention of the Research Committee to make arrangements whereby a series of tests similar to those upon which the Gottschalk report is based will be conducted under cold weather conditions.

Most of the fuel session was devoted to a paper by C. S. Kegerreis and G. A. Young entitled "An Experimental Survey of Gasoline and Kerosene Carburetion," in which considerable data covering the performance of various engines and carbureters using gasoline and kerosene fuel were presented. The paper was intended as a general discussion of gasoline carburetion requirements. The authors took the view that a research in respect to performance on kerosene is desirable not so much as outlining the requirements for burning this fuel as in indicating certain possible limiting conditions which may have to be met if it becomes necessary to use fuels of 550 deg. Fahr. end point.

The paper attempts to show what limiting temperatures are controlling in respect to maximum power, maximum economy, inflammability, etc. To this end engines were operated with inlet air temperatures varying from 150 to 350 deg. Fahr. The effect of temperature upon the metering characteristics of various types of carbureters are shown by presenting several curves plotted between the rate of air flow and gasoline per pound dry air used.

Among the conclusions reached is one to the effect that an air temperature of 150 deg. Fahr. is the minimum that it is wise to maintain.

In discussing this paper P. S. Tice of the Stewart-Warner Speedometer Corp. stated that in his experience

Table of Fuel Characteristics as Determined by Wilson and Barnard

No.	Fuel	Baumé Grav. Deg.	Spec. Grav.	Distillation Temperature, Deg. Fahr.					Distillation Range	Av. Dew Point	Av. Mol.'r Wt.	Mol. Heat of Vap. from Vap. Pressure	Temp. of 760 MM Vap. Pres.	Temp. of Equilib at 760 MM	Initial Condensation 12:1 Mix. Ratio	Initial Condensation 15:1 Mix. Ratio
				Initial	50%	80%	85%	95%								
1	Socony Ker. (2nd Sample)	45	.800	159	224	247	254	277	118	225	178	9850	....	....	95	89
	Socony Ker. Equil	....	....	....	....	....	....	....	....	....	....	11200	244	244	....	....
2	Perfection Ker.	42	.814	126	213	228	234	251	125	210	168	6980	....	....	85	80
	Perfection Ker. Equil	....	....	194	230	246	249	270	76	228	180	10700	227	230	....	....
3	No. 3 Kerosene	....	....	168	233	258	266	296	128	233	184	7770	....	....	105	101
	No. 3 Kerosene Equil	....	....	....	....	....	....	....	....	....	....	11750	251	252	....	....
4	Socony Gasoline	60	.743	60	128	160	169	196	136	128	115	7510	....	....	40	34
	Socony Gasoline Equil	....	....	83	195	216	225	242	159	182	147	8600	158	157	....	....
5	Red Crown Gasoline	57	.752	35	138	177	184	210	185	131	117	6500	....	....	53	48
	Red Crown Gasoline Equil	....	....	85	185	211	224	253	168	184	148	7450	175	173	....	....
6	High End Point Gasoline	57	.752	62	154	190	208	236	174	147	126	7550	....	....	63	58
	High End Point Gasoline Equil	....	....	32	218	233	238	256	124	204	163	10600	187	187	....	....
7	C. F. A. Gasoline A	62	.727	49	121	151	160	170	121	121	111	5100	....	....	28	24
	C. F. A. Gasoline Equil	....	....	....	....	....	....	....	....	....	....	7770	150	151	....	....
8	C. F. A. Gasoline B	61	.733	52	126	164	174	202	150	125	114	5400	....	....	37	32
	C. F. A. Gasoline B Equil	....	....	....	....	....	....	....	....	....	....	8250	163	163	....	....
9	C. F. A. Gasoline C	60	.736	52	134	176	186	217	165	135	119	5910	....	....	49	44
	C. F. A. Gasoline C Equil	....	....	....	....	....	....	....	....	....	....	8800	176	176	....	....
10	C. F. A. Gasoline D	59	.740	54	139	191	202	234	180	142	123	6520	....	....	66	60
	C. F. A. Gasoline D Equil	....	....	....	....	....	....	....	....	....	....	9750	192	192	....	....
11	Special Blend Gasoline	59	.740	45	134	188	199	231	186	135	119	5780	....	....	52	48
	Special Blend Gasoline Equil	....	....	....	....	....	....	....	....	....	....	8070	198	193	....	....
12	Fractionated Gasoline	....	....	96	146	168	182	208	112	147.5	127	7830	....	....	45	40
	Fractionated Gasoline Equil	....	....	....	....	....	....	....	....	....	....	8900	170	170	....	....
13	Domestic Aviation Gas	....	....	53	93	111	116	133	80	94	97	6280	....	....	1	−4
	Domestic Aviation Gas Equil	....	....	72	118	137	142	169	....	....	....	7630	101	103	....	....
14	High Volatility Aviation Gas	....	....	39	79	96	102	132	93	78.5	89	6100	....	....	−4	−9
	High Volatility Aviation Gas Equil	....	....	....	....	....	....	....	....	....	....	7160	93	93	....	....

he had found that maximum efficiency is not obtained when the mixture is leaned to the lower limit of inflammability. In some tests which Tice had conducted he said that he had found that the lower limit of inflammability is one in which the ratio of air to fuel by weight is 22.5 to 1.

Another member drew attention to the fact that the use of an orifice plate above the carbureter, employed by the authors of the paper as a throttle, does not give the same conditions as does a butterfly throttle valve. He emphasized, also, the fact that the carbureter box employed in making the metering tests does not simulate engine conditions, especially those at low speed in which an actual reversal of flow sometimes occurs in manifold.

E. H. Sherbondy stated that in his view the function of the carbureter is simply that of metering the fuel and diffusing it in the air stream. He stated that in a certain test he had made it had been found that the drop in pressure between the entrance and the throat of the Venturi tube is not always the controlling factor in respect to fuel flow. He had found, he said, that the total drop in pressure through the carbureter under full load conditions is often much greater than the pressure drop between entrance and throat of the Venturi tube itself, and that the volumetric efficiency of the engine is much less when an elbow is used below the Venturi than when a bell shape opening is employed instead.

P. S. Tice stated that it has been proven that mixture strength should vary with the load on the engine, rather than with the speed. He said that fuel lag in manifold causes many variations in mixture, the tendency being toward a richer mixture, formed when the throttle is being closed, and a leaner mixture when it is being opened, due to the effect of change in pressure upon the boiling temperature of the fuel deposited on the manifold walls.

The first paper presented at the fuel session was one giving further data on the effective volatility of motor fuels, and was prepared by Robert E. Wilson and D. P. Barnard, 4th. This paper presented information upon the following four lines of investigation:

(1) Improved methods for preparing equilibrium solutions and measure of vapor pressures, (2) data on effective volatility, (3) a series of empirical curves from which it is possible to obtain, with the data from the distillation curve, the dew points of a non-aromatic hydrocarbon fuel with approximate accuracy, (4) a table of comparison of the more definite properties of the fuels investigated and, in addition, definite evidence that the 85 per cent point is the best single measure of the effective volatility of a motor fuel from the standpoint of distribution and crankcase dilution.

It is pointed out in this paper that by subtracting 135 deg. Fahr. from the temperature at the 85 per cent point it is possible to approximate the true condensation temperature for paraffin hydrocarbon fuels. The figure to be subtracted varies, however, from 160 deg. Fahr. for high boiling to 110 deg. for volatile fuels. A tabulation which summarizes the more important properties of the fuels investigated is given herewith.

There was no discussion of this paper or that presented by W. M. Welch on behalf of F. L. Bayer dealing with the subject of proper utilization of natural gasoline. In the latter paper gasoline manufactured from natural gas and used as a blending agent for furnishing the more volatile constituents of certain grades of gasoline was considered. This natural gas gasoline is highly volatile and when properly blended with other fuel makes an excellent substitute for straight run gasoline.

Commercial Aviation Success Depends Upon Safety

Public must be sold on reliability of aircraft. Aeronautic session brings symposium of views. Warner discusses design practice.

By J. Edward Schipper

THE airplane industry should apply itself to selling the public more thoroughly on the safety and practicability of commercial aviation. This was the dominant thought suggested from the symposium of views on commercial airplane design presented at the Aeronautic Session. The meeting was attended by representatives from all of the active airplane companies, and provided interesting discussion on the probable future of commercial aviation in this country.

Prof. E. P. Warner in his paper on "Design of Commercial Airplanes," stated that it has been a common error in discussing those technical factors that enter into the design of the flying equipment for an air line, to neglect the specific conditions under which the equipment is to be used, and to speak of commercial design as though it were a thing set apart from ordinary aeronautical engineering practice, and as though it could be treated as a unit by standardized rule. Warner said in part:

Obviously, the first step in deciding on the general characteristics of an ideal commercial aircraft is to decide on the qualities of performance which the finished product should show. Obviously also the first of those qualities is economy. Air lines may operate under very grave handicaps of some sorts, but it is certain that they will not continue indefinitely to operate at a financial loss, and it is therefore a prime essential that the equipment used should be such that the costs of operation will be restricted to a figure making it possible to compete on reasonably equal terms with existing forms of transport. The only exception to the necessity for economy arises in the case where a government subsidy of great liberality exists, a subsidy that amounts to a government offer to pay all the bills and make the operating company independent of the traffic. Since it is neither desirable nor possible that such a condition should ever exist in the United States, it can be wholly disregarded in considering design for operations in this country.

Second of the requirements, and indeed subordinate to no other in importance, for it is vital, is safety. It is futile to blink at the fact that the major source of difficulty in securing increased patronage for air-transportation facilities today is the danger that the lay imagination magnifies far beyond the reality. The elimination of the gap between the real and supposed risks of air travel is a problem in public education, and in the dissemination of accurate information, but the reduction of the real hazard

is a responsibility definitely to be shared by the designer of the airplane and by those charged with its operation.

Third, we may list speed, in which air transport, like most other modern means of transport, finds its principal justification. Were there no reason to desire speed, the transcontinental railroads would never have been laid down, and goods and passengers would still be traveling in sailing ships around Cape Horn. Were there no reason to desire speed, British officials with business in Mesopotamia would still be making the journey from Cairo to Bagdad by caravan instead of traveling by air in fewer days than the old method would have required weeks. Air transport is at present, and is likely to remain, considerably more costly than surface transport, and it can only justify its existence by demonstrating a clear saving of time for a journey. The greater the difference of cost is, the greater the economy of time must be.

The fourth and last of these fundamentals is comfort. It may perhaps be said to be less important than the others, but that is very doubtful, for it is certain that only under the press of the most urgent necessity will passengers continue to travel in an unpleasant and fatiguing manner. The whole development of modern civilization has been in the direction of increasing comfort and convenience, and of converting the articles of luxury of yesterday into the accepted necessities of today. Study of commercial aircraft of the past and present suggests that some designers have started with the idea that the passenger requires nothing except to be placed on board of a projectile and shot through space with a maximum of velocity. The cases in which the desire for speed absolutely outweighs all other considerations will, however, be found few and far between.

E. P. Warner read a paper on commercial plane design

To obtain economy means to reduce the sum set aside for the repayment of the first cost, as well as to reduce the costs of operation. The group of items relating to first cost, including depreciation and interest on the capital tied up in equipment, can be cut down by designing for long life and for reliability of service. The effect of long life on the depreciation allowance is obvious, and reliability enters in because airplanes and powerplants designed for a maximum of reliability can be kept continuously in service without laying up for overhauling and repairs, and the amount of capital tied up in reserve machines can thus be materially reduced. The differences in this respect among the companies now operating are really amazing, the percentage of reserve airplanes ranging from less than 100 to over 300. Since the average price of a commercial airplane is from $2,000 to $4,000 per passenger carried, it is manifestly undesirable to keep three-quarters of these machines idle in the hangars.

Increased Use of Metal

The first possibility that comes to mind in connection with design for durability is the increased use of metal construction. While there is no question that this is the best direction to pursue under some conditions, notably in the tropics, it is not at all certain that the life of an airplane for service in temperate climates is increased by the use of metal, while the cost in small lots indubitably goes up. In fact, a study of the records of operation suggests that the promotion of durability in airplanes is a matter of a reduction of the crash hazard.

As a rule, the thick-wing cantilever-type has a slight advantage in economy of operation at moderate speeds, while machines with externally braced wings give the better results when the operating speed is twice the minimum or more, because of the higher efficiency of thin airfoils at low angles of attack. In general, it can be said that an airplane having a maximum speed of 100 m.p.h. can carry 18 lb. per hp. and 9 lb. per sq. ft., giving it a landing speed of approximately 50 m.p.h. and a rate of climb high enough for safety in flying over reasonably smooth country. If 40 per cent of the total weight goes into useful load, the pay load, making an allowance for fuel for a 4-hr. flight and for the weight of one member of the crew for every 300 hp., should be roughly 4.5 lb. per hp.; this makes it possible to carry one passenger for every 40 hp. This is approximately equal to the best economy record that has been shown on any of the European commercial airplanes. The monoplanes have a distinct advantage over other types in respect to vision, but the discussion of that point can be postponed for treatment in connection with other matters bearing on comfort and convenience.

Airplane Size

The relative economy of airplanes of different sizes has long been a moot question, and is one on which violently different opinions have been expressed by the proponents of various schools of design. It is my belief that the subject has suffered from the excessively frequent introduction of the semi-fallacious square-cube law, and that the investigations of the theory of the effect of size have seldom given the large airplane its due. Experience shows the possibility of increasing the ratio of useful load to total weight as the size is increased, provided only that the weight is distributed along the wings in such a way as to reduce the flying stresses. This is sometimes objected to in military aircraft for military reasons, but there is no valid objection to the use of an efficient distribution of weight in commercial airplanes unless the powerplants are placed in inaccessible locations in an endeavor to distribute their weight. The ideal for the airplane of great size appears to be the cantilever monoplane with the engines arranged in two, three or four groups along the span of a supporting surface thick enough to permit a mechanic to pass inside of it from one powerplant group to another. The general plan is that of the Staaken-built Zeppelin monoplane.

There is another gain in percentage of pay load in that the proportion of the useful-load capacity which goes into the weight of the crew is less in a large airplane than in a small one. The weight of a pilot must be allowed for in any case, even on a 100-hp. machine; a crew of two, including the pilot, suffices for anything up to 1000 hp., and three men should suffice for double that power. To keep the weight of the crew down to 0.5 lb. per hp., at least 700 hp. must be used if an assistant pilot is to be carried, as is in general wise practice. The very large airplane has the advantage not only in improvement of the weight ratio just noted, but also in the larger amount of space available for the passengers, resulting in more comfortable travel; in the greater safety which results from a multiplication of units and from the installation of radio and other navigating equipment which is too heavy to be carried in a three or four-passenger machine.

The coming of the giant airplane in commerce is prevented only by the lack of public demand for its services. Obviously, however great the saving in unit cost, there is no financial advantage in using machines so large that they cannot be completely filled. It must be remembered that the railroad has a certain advantage over the airplane in that the railroad's operating units are made up

of multiple elements and that cars can be attached and detached at will. To gain a similarly variable capacity an air-transport enterprise must either have available machines of different sizes, the choice among them for a given trip depending on the amount of business, or must run small machines and many of them, starting several together at each hour when a departure is scheduled and distributing the load among them instead of carrying the same total amount in a single large airplane. The best plan appears to be to compromise, using machines of two different sizes. One of these sizes should be such that a single machine will take care of the normal traffic on a single trip with about 10 per cent of the seats unoccupied, while the other should be much smaller and held in reserve to take care of overflow demand. The usual practice at present is to run a definite number of machines of fixed size, and the schedule has not been subject to alteration in emergencies except on reasonably long notice. Passages must therefore be engaged well in advance to make sure of securing them.

It can be laid down as a general rule that, on a popular service, the spacing of departures should be about 30 min. for every 100 miles of length of route. The size of machine used should not be increased beyond six or eight-passenger capacity until that frequency of service has been attained, but thereafter any additional requirements of the traffic should be taken care of by increasing the size of the unit. When we have a route on which there is a steady traffic four or five times as large as that which now exists between London and Paris there will be justification for the use of airplanes carrying thirty to forty passengers each, and they are sure to come. Already, in his report to the French Chamber of Deputies on the current aeronautical budget, M. Bouilloux-Laffont has considered seriously the possibility of bringing into service airplanes carrying ninety passengers each and has given some estimated figures on the probable operating costs of such a giant, showing much lower unit-cost than any present type. The ninety-passenger airplane is not by any means at hand at present, but the trend of progress is distinctly in that direction.

Safety is dependent chiefly on reliability, structural strength, stability and control, fire prevention and the measures taken to reduce the risk of injury to the passengers if a crash should occur. Reliability has already been mentioned. It becomes of increasing importance, from the safety point of view, with increasing ruggedness of the country flown over and with increasing landing-speed of the airplanes. A high landing-speed makes it possible to obtain high speed without an unreasonable sacrifice of economy, but it necessarily increases the danger in a forced landing. The only possibility of using really high wing-loadings, where a single powerplant is used or where in general the design is such that sudden forced landings need be considered, arises through the application of some variable-lift device.

Speed and Comfort

The steps that must be taken to secure speed have already been suggested. I have shown, in a paper entitled Airplane Performance Formulas, that the speed is governed almost solely by the ratio of the wing loading to the power loading. An increase in the speed therefore means either an increase in the wing loading, with a resultant rise in the landing speed and a loss of climbing power, both of which mean decreased safety, or a decreased power loading, which carries with it a direct and inevitable loss of economic efficiency as measured by pay load per horsepower. The result is that speed will always be kept as low as possible without loss of business to competing transportation enterprises operating on the ground or water. Over the water, operating speed can be cut as low as 70 m.p.h.

Comfort, the fourth and last of the general qualities to be sought, calls with particular force for discussion by writers, for it has unfortunately suffered from neglect by the designers of commercial aircraft as a whole. Comfort in its broadest sense means good seating arrangements, good ventilation and heating if weather conditions require it, satisfactory vision from the cabin and reasonable freedom from noise. Concerning the seating arrangements, it is necessary only to give warning against excessive crowding of the seats and against the use of chairs turned so that the passengers will be facing backward. Air transport must appeal to the ordinary traveler. A fair percentage of such travelers object to riding backward in a train and the sensation is far more unpleasant in an airplane, particularly when diving for a landing.

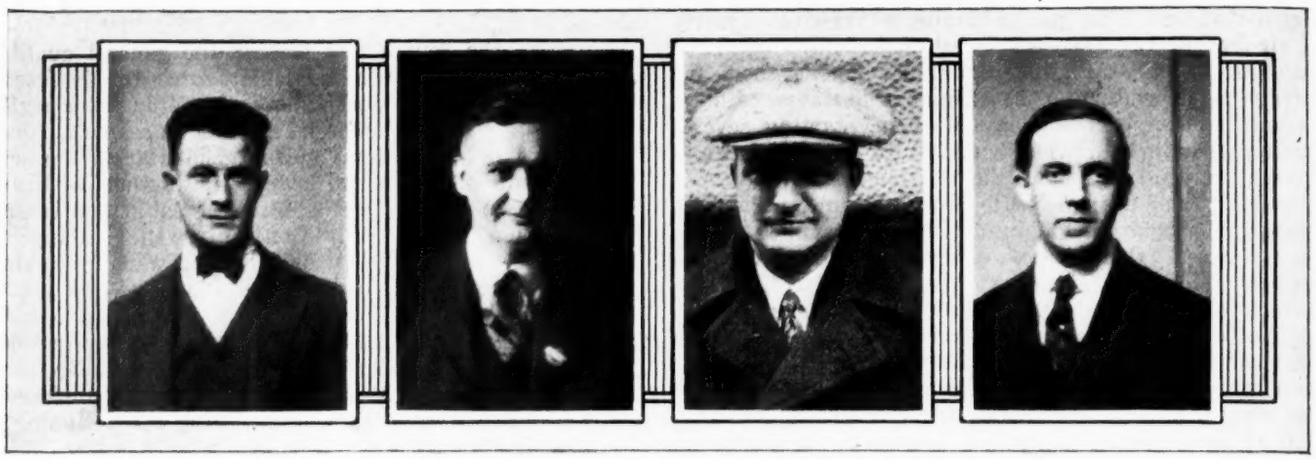
Government Obligations

Frank H. Russell spoke of the obligation which the Government has in carrying forward development. He stated that unless the Government gave the industry an opportunity to do its work, the industry would not be able to cooperate fully with the Government. He cited that out of 119 planes received by the navy, fifty-two were from the naval aircraft factory, seventeen from foreign sources and only thirty-seven from the American aircraft industry.

Russell pointed out the number of companies in good condition at the end of the war as compared with the number which are in red figures at the present time. The Government should see, he said, that engineering and construction data are available to the industry. Neither the army nor navy services have offered this data since the war. The fact that machines can be rapidly built was very aptly illustrated during the 1922 Pulitzer races, when machines were built in ninety days, which under the ordinary procedure would require a year. There is a necessity in this country, he brought out, for a civilian organization or industry with creative and productive facilities. England and France, he stated, are subsidizing commercial aeronautics, but in this country our Congress will not give us recognition on commercial aviation. Competitive bidding, Russell stated, should not be used except when the manufacturer does not produce reasonably.

Harry Bruno stated that although we may not realize it, commercial aviation is here now and we are ahead of Europe. The biggest asset that an aviation line can have, he said, is a reputation for carefulness. He cited the U. S. air service with a record of three years without a mishap. These records were made with the F5L and HS2 types or, in other words, with surplus air material. We have ample proof that flying is safe in spite of the fact that we have no air laws. The cost of getting the public to fly, however, is high and this is something which must be concentrated upon. We must let the public know in all ways that commercial aviation is here and in selling the public must bear in mind that the average individual is afraid of speed.

C. G. Peterson said that the market is ready for us if we sell our present customers, especially the United States mail service. By carrying more and more of the mail the fact that aviation is reliable and safe cannot help but be demonstrated to the public with the result that the patronage will increase. It is not meant that all of the mail carried by the Post Office can be handled by air, but the proper combination of railroad and airplane can be used to secure morning delivery of mail to distances not possible by train alone. We have only scratched the surface, he pointed out, by night flying possibilities. Proper organization will permit of this with safety and reliability resulting in remarkable mail facilities.



Those who read papers at Detonation Session

Stephen M. Lee *J. H. Holloway* *Thos. Midgley, Jr.* *Stanwood W. Sparrow*

Experimental Data Presented by Speakers at Detonation Session

Midgley talks about the laws governing detonation. Lee and Sparrow describe fuel tests. High compression engine characteristics discussed.

By P. M. Heldt

THE session on Wednesday afternoon was devoted to detonation, all three of the papers scheduled relating to this subject either directly or indirectly. Detonation is a subject of importance because it limits the compression which can be used in Otto cycle internal combustion engines, and as the horsepower obtainable from an engine of given dimensions and the thermal efficiency both depend directly on the compression, detonation really limits the power and thermal efficiency of engines.

Detonation depends upon the character of the fuel, the compression ratio and the effectiveness of combustion chamber cooling. The so-called high end point gasoline has a materially greater tendency to detonate than high grade gasoline, such as that used in aircraft engines. Much of the difficulty in burning kerosene (in tractor engines) is also due to detonation. If it were not for the danger of detonation, much higher compression ratios would be used in modern automobile engines.

Two of the papers read at the detonation session related to experiments made on engines with super-normal compression pressures, detonation being prevented in one case by improving the cooling of what were originally the hottest parts of the combustion chamber wall, such as the spark plug and the piston head, and in the other—in which very much higher compressions were used—by employing fuels less given to detonation than gasoline. There was a good attendance at this session and a moderate amount of discussion followed the presentation of the papers.

The prevailing theories of detonation were outlined by Thomas Midgley, Jr., who gave results of some recent experimental work in his paper on "The Laws Governing Detonation." According to one, he said, the knock originates from the impact of one metallic part upon another, as, for instance, the impact of the piston against the cylinder wall, or of the shafts against their bearings, under excessively high pressure. The theory does not account for the origin of these excessive pressures, and this "mechanical knock theory" may therefore be dismissed without further consideration.

According to the second theory, due to Ricardo, the explosion wave starts from the spark points and compresses the gaseous mixture in front of it that remains still unburned. Presently this unburned portion of the charge, whose temperature is raised by the compression, reaches the critical temperature of spontaneous ignition, and the whole of it is then set off at once. The abrupt increase in pressure thus produced causes detonation. Midgley showed a model in the form of a sheet metal tank with a slot in it parallel to its axis, to show the motion of a particle of the combustible mixture during the progress of combustion in the cylinder. By means of a revolving drum inside the tank, which could be observed through the slot in the latter, the forward motion of the particle during the first part of the combustion process, as long as it is ahead of the flame front, and its reverse motion after it has been overtaken by the flame front, could be made apparent.

Midgley said that he did not believe in this theory. It was a good deal like the phlogistic theory of heat, a sort of obvious assumption, but nature did not work exactly in that way. The other theory, and which he believed furnished the true explanation of the phenomenon, was based on experiments made in France by Mallard and Le Chatelier and in England by Prof. Dixon as long ago as 1888. They found that when a gaseous mixture contained in a long glass tube open at one end, is ignited at the closed end, the flame travels along the tube at first slowly but gradually acquires more velocity, and at a certain point there is a sudden tremendous increase in the rate of flame travel, and the velocity remains constant thereafter. He paid a strong tribute to these investigators for having succeeded in taking actual photographs of the flame at that early date, which, of course, required exceedingly high speed plates.

This phenomenon is undoubtedly duplicated in an engine when detonation occurs. The combustion wave starts from the spark plug points, which may be in the combustion chamber wall at one side of the cylinder, and travels across the cylinder, the pressure of the flame cap increasing all the time. If the opposite wall, or the part of the combustion chamber most remote from the firing point, is comparatively far away, the combustion wave may attain the critical maximum speed, and will then strike the opposite wall with great force, setting it into vibration.

It has previously been demonstrated mathematically that during the passage of a flame through a combustible mixture in a closed container a higher pressure must exist immediately in front of the flame than behind it, and that this pressure difference may be expressed by the following equation:

$$P_1 - P_2 = \frac{W^2}{g}(V_2 - V_1)$$

where P_1 is the pressure ahead of the flame front;
P_2, the pressure to the rear of the flame front;
W, the reaction velocity, expressed in pounds of mixture entering the flame front per second;
g, the acceleration of gravity (32.2);
V_1, the specific volume of the mixture (cu. ft. per lb.) in front of the flame;
V_2, the specific volume (cu. ft. per lb.) of gases behind the flame front.

According to the precepts of physical chemistry,

$$W = C\,D^n\,T^m,$$

where C is a constant;
D, the density of the mixture;
T, the absolute temperature;
n, an exponent depending upon the chemical reactions;
m, an exponent to be determined experimentally.

By combining the above two equations and inserting thermo-dynamic equivalents, the following equation is obtained:

$$P_1 - P_2\frac{APq}{P_1 - P_2} = B\,P_1^n - C\,P_2$$

where $A = 2\,J\,H\,L$, J being equal to 778;
H = effective heat value per pound of mixture
$L = W_o^2/(P_o q \times g)$

$$q = \frac{2\,[n + m\ (\gamma - 1]}{\gamma}$$

$$W_o = K\,D_o^n\,T_o^m$$

$$B = 2\,K\,\frac{1}{\gamma}\,L$$

K = constant of adiabatic compression
$= P_1\,V_1^{\gamma}$

$$N = q - \frac{1}{\gamma}$$

$$C = \frac{2\,\gamma}{\gamma - 1}$$

γ = ratio of specific heats.

This equation gives the difference between the pressure ahead of the flame front and that behind it, and, therefore, the pressure rise in the detonation wave. If values for n and m are assumed—they must actually be determined experimentally for each fuel—and a curve of P_1 vs. P_2 is then plotted, it is found that below a certain value of P_2 the pressure difference is merely nominal, but at the critical value for P_2 (the pressure back of the wave front) the equation can only be satisfied by making P_1 (the pressure ahead of the wave front) equal to infinity. It is believed that when its critical pressure is attained the wave front travels at the rate of sound, which is the highest velocity at which motion can be transmitted through the contact of molecules.

The history of catalysis teaches us that any chemical reaction can have its speed changed materially by the presence of a very small quantity of negative catalysts (or anti-knocks). Thus, for instance, the presence of one seven hundredths part of selenium telluride either in the tube in which the explosion experiment is carried out or in the engine cylinder will prevent detonation, that is, it will prevent the attainment of the critical rate of flame propagation.

Midgley has made many experiments to determine the actual pressures within the cylinder when detonation takes place, or, rather, when it just begins, with the object of determining the effect of various factors in engine operation on this critical pressure. It was found that this critical pressure increases as the compression ratio decreases, because with lower compression there remain more dead gases in the cylinder, which have the effect of an anti-knock. The critical pressure increases as the inlet manifold vacuum decreases. Finally, the critical pressure increases as the inlet temperature decreases. A set of charts was given with the paper showing the relation between the critical pressure and each of these factors under certain specified conditions. The tests on which these charts were based were made with kerosene distillate of which the first drop passed over at 366 deg. Fahr., and which had an end point of 508 deg. Fahr.

Discussion of Midgley Paper

In the discussion, W. S. James of the Bureau of Standards said he could give some particulars of a method that had been used for determining the rate of chemical combination. It consisted in photographing the flame of a Bunsen burner which was fed with a mixture of the components whose rate of reaction it was desired to investigate. The cone of the flame was then measured, and from the figures obtained the speed of combination was calculated.

Testing Fuels for High Compression Engines

STEPHEN M. LEE and Stanwood W. Sparrow of the Bureau of Standards in their paper on Testing Fuels for High Compression Engines describe tests made for the most part with a single-cylinder Liberty engine to determine the best compression ratio for different fuels and fuel mixtures. The range of compression ratios experimented with was from 5.4 to 14. The results with different fuels and different compression ratios are plotted in Fig. 1 and it will be seen that there is an increase in the indicated mean effective pressure and a decrease in the specific fuel consumption with each increase in the compression ratio. The maximum power is obtained with approximately the same amount of fuel in each case, and the increase in power with the higher compression ratios is not obtained at the expense of a rich mixture.

The authors point out that the mixture ratio-power curves have a very flat top, and in some cases a variation of 20 per cent in the specific fuel consumption resulted in only 1 per cent difference in the power output. A curve is given showing that with two of the fuels used the same maximum power was obtained from the engine, but in one case it was obtained with a consumption of 14 lb. per hr. and in the other case of 17 lb. Therefore, in comparing different fuels, it is necessary to determine the fuel ratio of the mixture.

It should be noted that accurate measurements of the

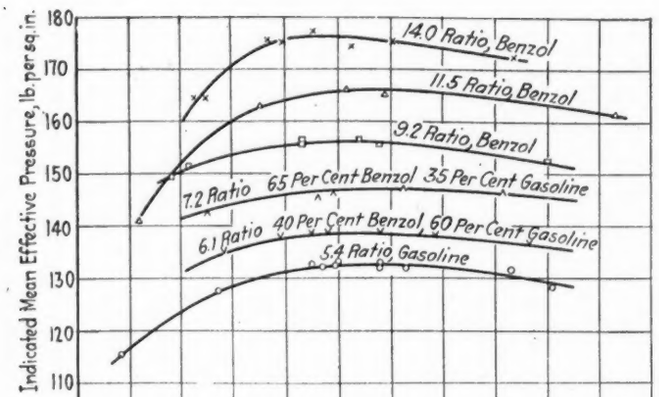

Indicated Mean Effective Pressure, lb. per sq. in.
14.0 Ratio, Benzol
11.5 Ratio, Benzol
9.2 Ratio, Benzol
7.2 Ratio 65 Per Cent Benzol 35 Per Cent Gasoline
6.1 Ratio 40 Per Cent Benzol 60 Per Cent Gasoline
5.4 Ratio, Gasoline
Fuel-Consumption, lb. per i. hp-hr.
Fuel-Consumption, lb. per hr.

Fig. 1—Fuel consumptions and indicated mean effective pressures for different fuels and compression ratios

mixture-ratio are not essential to obtain the benefits of mixture-ratio runs. The results of these and many other engine tests have shown that the quantity of air entering the engine per cycle does not vary appreciably with changes in the mixture-ratio. Hence, for a given engine speed and throttle opening, a curve of power versus fuel-consumption is essentially power versus mixture-ratio, even though the actual mixture-ratio is unknown. This is particularly fortunate, for, while accurate measurements of the fuel-consumption are easily obtained, the situation is very different with regard to measurements of air.

The improvement in the efficiency with increasing compression was obtained in spite of the very unfavorable form of the Liberty cylinder compression chamber with high compression ratios. At a speed of 1500 r.p.m. the maximum i.m.e.p. of 176 lb. per sq. in. was obtained with a compression ratio of 14 to 1. At 1100 r.p.m., owing to the higher volumetric efficiency at this lower speed, the maximum i.m.e.p. was 192 lb., and with a mechanical efficiency of 90 per cent the brake mean effective pressure for such an engine would be 173 lb.

The lowest compression ratio, viz., 5.4, was used with gasoline. As the compression ratio was increased above this value, it became impossible to operate on pure gasoline, and just sufficient benzol was then mixed with the gasoline so the engine would run without detonation.

In determining the percentage of benzol or alcohol necessary with each of the various compression-ratios, the criterion was that the detonation and consequently the maximum pressures should not exceed those resulting from the use of aviation gasoline at the standard 5.4 compression-ratio with the spark-advance and the mixture adjusted for the maximum power. It is significant that, when using a suitable fuel at a compression-ratio of 14, the maximum pressures as verified by diaphragm tests were no greater than those resulting from the detonation ordinarily present with a 5.4 ratio under normal service conditions. Mean pressures at the higher ratios are, of course, much greater.

TABLE 1—MIXTURES USED WITH DIFFERENT COMPRESSION-RATIOS

Compression-Ratio	Per Cent by Volume Benzol	Gasoline
5.4	0	100
6.1	30	70
7.2	65	35
9.2	85	15
[a]11.5	100	0
14.0	100	0

[a]Although 100 per cent of benzol was used in the tests at this ratio, undoubtedly a blend containing a very small quantity of gasoline would have been satisfactory.

In this work detonation was estimated by sound, by the decrease in power, by the increase in jacket loss and by the destruction of diaphragms so mounted in a spark-plug shell as to constitute an uncooled portion of the combustion-chamber wall. Considerable confidence was placed in the last-named measurement, since it is a gage of the destructive effect of detonation, which phase of the problem is of major importance in aviation work.

In using alcohol as an anti-detonation agent, it was found to be approximately twice as effective as benzol at the low compression-ratios where the greater portion of the fuel blend was gasoline. At the higher ratios where the gasoline was the lesser constituent there seemed to be little difference between the effect of benzol and that of alcohol.

Fig. 2 has been constructed to show the possibilities open to the engineer in designing an engine to use a fuel of known detonation characteristics. It gives the relation between the compression ratio, the volumetric efficiency, the indicated mean effective pressure and the compression pressure.

An example will show best how these curves may be used. Assume a fuel and an engine design such that with an absolute compression-pressure of 160 lb. per sq. in.

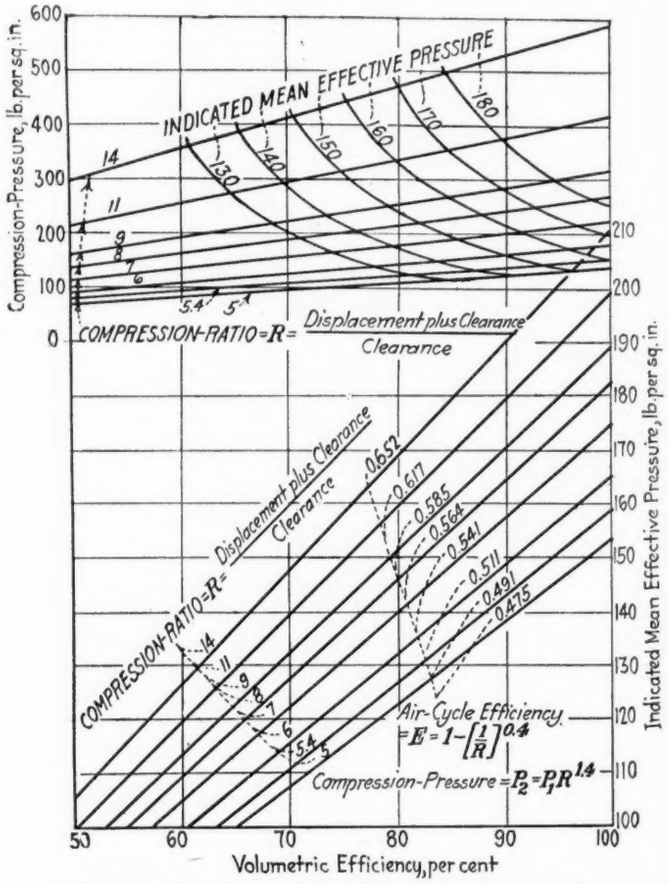

Compression-Pressure, lb. per sq. in.
INDICATED MEAN EFFECTIVE PRESSURE
COMPRESSION-RATIO=R= Displacement plus Clearance / Clearance
Displacement plus Clearance / Clearance =R= COMPRESSION-RATIO
Air-Cycle Efficiency E=1-[1/R]^0.4
Compression-Pressure P2=P1R^1.4
Indicated Mean Effective Pressure, lb. per sq. in.
Volumetric Efficiency, per cent

Fig. 2—Chart for determining the compression pressure and indicated mean effective pressure from the volumetric efficiency and compression ratio

there is an adequate margin of safety against detonation. From the upper curves it is seen that a pressure of 160 lb. per sq. in. would be obtained with a volumetric efficiency of 71.5 per cent at a compression-ratio of 7 and with a volumetric efficiency of 89 per cent at a compression ratio of 6. The lower curves show an indicated mean effective pressure of 125 lb. per sq. in. to be developed with a volumetric efficiency of 71.5 per cent at a compression-ratio of 7, while an indicated mean effective pressure of 147 lb. is obtained with 89-per cent volumetric efficiency at a ratio of 6. For the 7 ratio the air-cycle efficiency is 54.1 per cent; and for the 6 ratio, 51.1 per cent. Hence, with the lower ratio the indicated power would be 17.5 per cent greater with an efficiency, on the basis of indicated power, 5.8 per cent less.

Fig. 2 makes clear why with a given fuel an engine of high volumetric efficiency is limited to a lower ratio than one of lower volumetric efficiency. It shows also that, so long as detonation is the limiting factor, the greatest power output with a given fuel and engine may be obtained by first securing the highest possible volumetric efficiency and then employing the highest compression-ratio that will provide adequate safety from detonation.

In some instances preignition rather than detonation may be the factor that determines the proportions of the blended fuel. This may be the case with alcohol-gasoline blends, for, although alcohol seems to possess more anti-detonation effect than benzol, it appears to be more prone to preignition.

Several preconceived notions were disproved by this series of experiments, as, for instance, that alcohol and benzol require a greater spark advance than gasoline. Runs were made with various spark-advances with each of the three fuels at a compression-ratio and a throttle-opening such that no detonation was present with any of the fuels. However, the maximum power was obtained with the same spark-advance with each of the fuels tested.

Some investigators also have found a marked decrease in the jacket loss in changing from gasoline to benzol. No such effect was noted in any of these experiments and it is believed that where it was observed it was due to the fact that with the gasoline the engine was run under conditions such that detonation had set in.

Discussion

In reply to a question by Chester Ricker, Lee said that with benzol there was no more corrosion of the valves than with aviation gasoline. Sherbondy suggested a comparison of the results obtained at the higher compression ratios with those obtained in Diesel engines, and in this connection another speaker gave the following fuel consumption figures for Diesel engines of different sizes in pounds per horsepower hour: 600 hp., 0.48; 800 hp., 0.47; 1400 hp., 0.43; 1600 hp., 0.41. In reply to a question, S. W. Sparrow said that the engine ran just as smoothly with the 14:1 compression as with the lower compressions. Dr. James pointed out that for the same compression ratio a Diesel engine would be less efficient theoretically than an Otto engine, for the reason that in a Diesel engine the expansion ratio is less than the compression ratio, expansion beginning only after fuel injection has ceased. Others testified to the possibility of using higher compression than is customary at present. Midgley said that he had changed over a Buick engine to a 7 to 1 ratio and they accidentally got 1/16 in. too much metal on the piston head. With a 7 to 1 ratio the compression chamber is already quite flat and an additional 1/16 in. taken off makes a big difference. Nevertheless the engine gave excellent results. Horning said that if any one had suggested a year ago to use a compression ratio of 5 to 1 with Red Crown gasoline he would not have been taken seriously, yet he knew of at least eight parties using it today.

Engine Characteristics Under High Compression

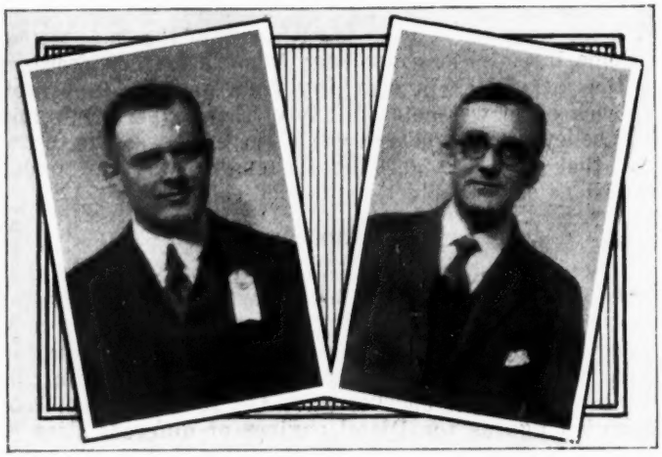
IN a paper on Internal Combustion Engine Characteristics under High Compression, J. H. Holloway, H. A. Huebotter and G. A. Young (who are connected with Purdue University) distinguish between two kinds of detonation. One kind, which is sometimes described as a sharp metallic pinking effect, can often be eliminated by retarding the spark, in which case it is due to excessive spark advance, while at other times it is not affected by changes in the spark timing, when it is due to some overheated spot in the combustion chamber. The other kind of detonation occurs after combustion has been initiated by the electric spark and is characterized by a dull, heavy thud. This is believed to be due to the fact that when the process of ignition has begun in the normal way and the flame has traveled through a part of the compression chamber, the temperature and pressure of the charge ahead of the flame cap rise to such values that all of it is set off at once by spontaneous ignition. This theory is said to be supported by the fact that when certain suspected high temperature areas are more intensively cooled, so that the heat due to the compression, etc., is more readily carried off, the knock disappears.

The first experiments made by the authors were with a six-cylinder poppet valve engine. At first a compression of 150 lb. per sq. in. was used to accentuate the detonation and facilitate the location of its source. A great deal of trouble from pre-ignition was encountered, at first from the spark plugs and later, when this had been remedied, from the exhaust valves, the seats of which were not completely water-jacketed. For this reason the poppet valve engine was discarded and all later tests were made with a 4-cylinder 4⅛ x 4½-in. Willys-Knight sleeve valve engine.

With the Knight engine cylinders Nos. 1 and 4 detonated severely and attempts were made to discover the cause. There were three possible causes, viz., restricted circulation of the cooling water around the end cylinders, unequal distribution of the fuel charges and arrested scavenging of the center cylinders. Using a manifold for the water connection, so that the water had to circulate substantially uniformly throughout the jacket, made very little difference. To obtain better charge distribution a hot spot manifold was applied to the engine, but the high temperature of the hot spot required to produce vaporization promoted detonation and consequently an inter cooler was used. However, cylinders Nos. 1 and 4 continued to start to detonate before cylinders 2 and 3, although not to such a marked degree.

In an engine of this type, provided the spark plugs are effectively cooled, the hottest surface will be that of the piston head, and for this reason the original cast iron pistons were replaced with aluminum alloy pistons of substantially the same design.

As a result of the preliminary work a compression ratio of 6.75 to 1 was chosen, giving a compression of 122 lb. per sq. in., the original compression ratio having been 4.45 It was found that the use of aluminum pistons permitted of greater spark advance than could be used previously. Special spark plugs with their shells in direct contact with the cooling water formed the central portion of the cylinder heads and acted as anchorages for the demountable water-jacket cover.



O. C. Berry, presided at Fuel Session *T. J. Litle presided at Engine Cooling Session*

The hot-spot vaporizer, already referred to, was so arranged that the temperature of the mixture entering the manifold could be controlled at will. After being heated to the point beyond which previous tests had shown no further gain in economy, the mixture was cooled again in the vertical extension of the manifold, but its maximum temperature was substantially restored again in the main inlet manifold, which was hot-water jacketed.

With this engine several series of tests were run to determine the power under wide open throttle and the fuel consumption or thermal efficiency at various speeds and under different loads, as well as the effect of changes in the mixture ratio on the thermal efficiency. The following conclusions are arrived at:

(1) Under laboratory conditions, a compression pressure of 120 lb. per sq. in. gage is perfectly feasible when factors that induce detonation are eliminated.

(2) Under service conditions, the same attention to these factors will permit the use of much higher pressures than those common at present.

(3) An increase in the compression-ratio results in a marked improvement in the thermal efficiency and the general performance of the engine at all loads and in the maximum power at all speeds.

(4) The sources of detonation are the spark-plug, the exhaust-valve, the piston-head and any other portions of the combustion-chamber walls that become overheated.

(5) The maximum economy is obtained with the leanest fuel-air mixture giving reliable combustion. Such a mixture varies from 0.060 lb. of fuel per lb. of dry air at 25-per cent load, to 0.057 lb. at 75-per cent load; or, from 16.6 to 17.5 lb. of dry air per lb. of fuel. Hence for this range of load the leanest possible mixture is desirable, provided good vaporization is secured. At full throttle-opening, the maximum power is usually sought at the expense of economy. A 0.075 mixture, or 13.3 lb. of air per lb. of fuel, is rich enough to insure the greatest output.

(6) The water-jacket heat-loss reaches its maximum value at approximately the mixture giving the highest power with a fixed throttle-opening, or a 0.075 ratio.

(7) The exhaust temperature is highest with a 0.065 ratio.

(8) The power of an engine can be increased 25 per cent by a change in the compression ratio from 4.45 to 6.75, provided detonation is absent.

(9) With the same change in the compression-ratio, the thermal efficiency is raised 7 to 12 per cent through a load range of 25 to 100 per cent of the engine power.

(10) At full load, a mixture temperature of 125 deg. Fahr. at the hot-spot is high enough to give good distribution in a four-cylinder engine with a properly designed hot-spot. If the mixture is cooled below this temperature between the hot-spot and the valves, the performance of the engine is improved. A low limit of 100 deg. Fahr. at the valves can be allowed safely.

(11) At partial throttle-opening, a hot-spot temperature of 175 deg. Fahr. is not excessive and assists in the use of very lean mixtures for high economy.

In the opening discussion of the Holloway paper, Thomas Midgley said he regretted that the characteristics of the fuel with which the tests were made were not given. The results of the tests would be incorporated in the records of the Society, and ten years from now without the distillation curve of the fuel they would not mean anything. A written discussion of the paper by J. G. Vincent was presented, in which he said that since the tests described had been made with a Knight engine he hoped further tests along the same line would be made with an up-to-date poppet valve engine. The theoretical gains in power and thermal efficiency from high compression were very alluring, but usually between 100 and 110 lbs. a very distinct loss occurred, and roughness in operation set in which was very objectionable.

Another speaker said that at higher compressions trouble from carbonization increases, and he had found that with 85 lbs. gage pressure the carbon had to be removed twice as often as with 70 lb. S. W. Sparrow said it had come to be more generally recognized that it was the compression pressure rather than the compression ratio which determined detonation. S. D. Heron, who has been doing a great deal of development work in connection with aircraft air-cooled engines, said he had succeeded in obtaining 155 lbs. m.e.p. with wall temperatures of 700 deg. Fahr. With flat cylinder heads there was a great deal of detonation, but with hemispherical heads it was greatly reduced. He ran with a certain amount of detonation and got the best results that way.

Heat Value of Fuels

J. H. Holloway, who presented the paper, said that the fuel used was Red Crown gasoline as marketed in Indiana, but that no distillation test had been made. The cooling water temperature was kept between 170 and 190 deg., and it was found that the higher the temperature the greater the detonation. Whenever detonation starts the power falls off rapidly.

O. C. Berry wanted to know how the heat value of the fuel had been determined for the calculation of the thermal efficiency as given in the paper. He also said that there were three methods of determining friction horsepower: 1. Cutting out one cylinder at a time and noting the difference in the power. 2. Motoring the engine by means of the dynamometer. 3. Using a diaphragm meter as developed by the Bureau of Standards.

H. L. Horning, who presided at this session, said that he had been using 19,400 B.t.u. as the low heating value of gasoline, and pointed out that the thermal efficiency calculated would vary with the heat value assumed.

Midgley said 20,000 B.t.u. was a round figure, but the actual value should be used in each case. Professor Lay of the University of Michigan said that he had been using from 19,600 to 19,800 B.t.u. J. W. Stack of the Standard Oil Co. of Indiana said that they usually gave the lower heating value as 19,400 B.t.u.

New Plan for Sections Support Outlined at S. A. E. Business Session

Parent Society will pay each section $250, one dollar for each member residing in district, and two dollars for each section member enrolled. Special enrollment drive among college students.

A NEW plan for the support of section activities by the parent Society, authorization of a transportation meeting in the spring, a slight decrease in membership, and a slight treasury deficit were the chief reports presented at the annual business session.

The report of the membership committee showed that, not counting enrolled students, the Society had 5135 members on Dec. 1, 1922, as compared with 5227 at the same date in 1921 and 5190 in 1920. Consequently, there has been a slight decrease. The total number lost the past year through death, resignation or cancellation was 680, and this loss was made good by new enrollments to within about 100.

A special drive was made for student enrollments through professors at the colleges, and as a result this class of membership increased from 90 to 214 during the year. A campaign was conducted among passenger car men, because it was found upon analysis that the parts industry had by far the best representation in the Society, and the actual builders of passenger cars were not represented as well as they might be. A campaign was also made among production men, particularly in connection with the Production Meeting at Detroit. This meeting was attended by a large number of non-members, most of whom showed great interest in the proceedings, and some applications had been received as a result. Endeavors were also made to enroll some of the leading executives in the industry, and five men of high standing had been induced to join the Society.

Meetings Committee Report

C. F. Scott read the report of the Meetings Committee, according to which five meetings were held during the past fiscal year. The Production Meeting at Detroit was a new departure, and proved highly successful, the attendance being of the same order as that at the best annual meetings ever held by the Society. The Council has authorized a spring meeting to be held in Cleveland, which will probably deal with transportation problems. No place has yet been selected for the Summer meeting. White Sulphur is not available, on account of extensive alterations in the hotels being made there. Virginia Hot Springs has been considered, also West Baden, but there seems to be considerable sentiment in favor of Spring Lake, an eastern resort. The Summer meeting has always been largely devoted to recreation, and while this does not meet with the approval of a certain section of the membership, it seems to meet the desires of the majority. Experience, moreover, has shown that the location and the distance from the chief centers of the industry are secondary to the facilities offered for recreation, in determining the attendance.

Coker F. Clarkson read the report of Treasurer Whittelsey, who was absent on account of sickness. The report showed that the Society had closed the year with a slight deficit. It is the desire of the Council to keep the expenditures within the income in the future, and the budget for the coming year, which was included in the printed report, was set up with this object in view.

A. K. Brumbaugh read the report of the Sections Committee, from which it appeared that the major portion of the section's expense is now borne by the parent society. The suggestion had been made that the parent society should bear all expenses of the sections, but inasmuch as this would involve close supervision of the activities of the individual sections it was felt that this would limit section initiative, and would not be beneficial. It is therefore planned at the present time to pay to each section a basic sum of $250, plus one dollar for each S.A.E member residing in the district, plus two dollars for each section member actually enrolled and paying his dues.

Another problem that has come up again and that will require the attention of the incoming Sections Committee is that of admitting to the sections, men who are not members of the parent society. At one time a class of members known as section affiliates existed, but it was discontinued because in many cases these affiliates claimed all of the privileges of regular members.

President Bachman in his annual report regretted that engineers did not participate in larger numbers in the annual meetings of the Society. Engineering had been suffering from ingrowing thought, he said, and this could be remedied if engineers would get together more frequently and exchange their experiences.

Burnett presented the report of the Standards Committee, according to which 31 separate reports had been made to the Standards Committee by 17 sections. Of these, one had been withdrawn, one adopted with modifications, and one referred back to the section, the rest having been adopted. The report was accepted.

At this point the meeting adopted a resolution ratifying all business transacted at the summer meeting at White Sulphur, which was necessary because the Society is incorporated in New York state, and under its charter is allowed to transact business only in this state.

The tellers of election, of which L. S. Keilholtz was chairman, reported the result of their count, according to which the following new officials were elected:

Herbert W. Alden, president.
H. M. Crane, first vice-president.
A. F. Masury, vice-president, representing motor car engineering.
E. P. Warner, vice-president, representing aircraft engineering.
A. W. Scarratt, vice-president, representing tractor engineering.
L. W. Witry, vice-president, representing stationary i. c. engineering.
E. J. Hall, vice-president, representing marine engineering.
A. J. Scaife, W. A. Chryst, F. W. Gurney, H. M. Swetland and Lon Smith, members of the Council.

It is rather surprising that out of a total membership of more than 5000 only 952 voted. Of the ballots cast, 32 were defective, making the total effective vote 920.

New Styles at Body Builders' Show

Special coupe body with visor effect at front of roof one feature. Ellerbeck convertible body shown. Detailed refinements apparent throughout exhibit. Hardware and accessories prominent.

By George Mercer

FIVE novel bodies were of special interest at the Second Annual Automobile Body Builders' Show held at the 12th Regiment Armory, New York, January 8 to 13. The special jobs, shown by Hume, Holbrook, Willoughby, E. J. Thompson, and Ellerbeck, all had novel features from the standpoint of body design.

Hume showed an attractive coupe mounted on a Marmon chassis, which one visiting engineer referred to as an "inclosed roadster." The unusual lines of this job are clearly shown in the accompanying illustration. The roof is one piece with the back panel and is carried over to the front. The visor effect is gained by extending the roof well forward. Aluminum is the material of which the roof is constructed.

The rear deck lacks the conventional door at the top. Instead, entrance to the luggage space is through a side door on the right, just forward of the mudguard.

Holbrook showed a brougham mounted on a Packard chassis, which is also illustrated herewith.

A sedan mounted on a Studebaker chassis was shown by the Willoughby Co. This car has a trunk rack at the rear and a spare wheel forward. These features are shown in the accompanying illustration.

Two bodies were shown by the E. J. Thompson Co.; both were four-passenger coupes. One was mounted on a Westcott chassis. The untrimmed body is shown in an accompanying photograph.

The Ellerbeck convertible body was exhibited. This job has a metal top which rests flat over the rear deck when in its lowered position. Two photographs show this body, one with the top up, the other with the top down. This double use of the top is obtained by shifting the top bodily from one position to the other on rotating arms fastened to the sides of the car. When the top is in the lowered position it forms a continuation of the body in the rear seat, the edges of the top fitting into a recess in the body surface to preserve unbroken body lines. The design is such as to allow a spare wheel to be mounted in back of the seat. A full description of this interesting construction was given in AUTOMOTIVE INDUSTRIES of Feb. 2, 1922.

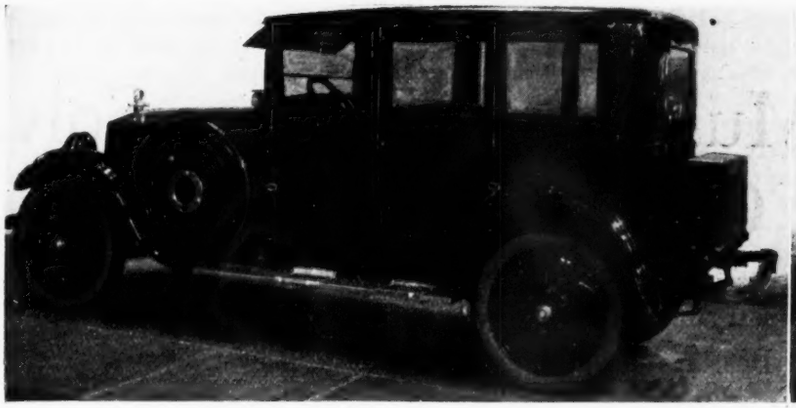
All of the bodies at this exhibit were exceptionally good examples of fine workmanship and enough construction details were shown to enable interested observers to see the refinements in building.

A taxi body trimmed with Japon leather cloth was shown by the Japon Leather Cloth Co. This body was exhibited on a Wire-On molding, covering the joint at the drip and belt. This molding is made by the Carter Co. and constitutes

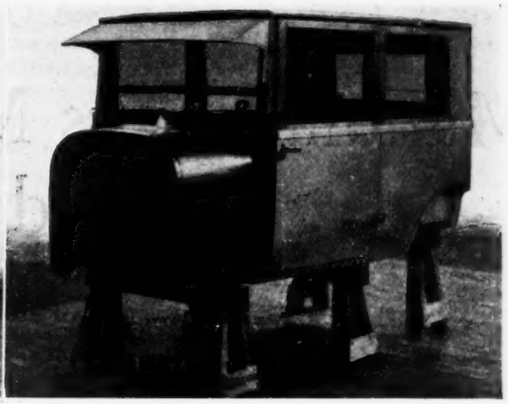
Ellerbeck convertible body with top up
Ellerbeck consertible body with top down

Special coupe built by Hume Body Corp. on Marmon chassis

Holbrook brougham on Packard chassis



Willoughby sedan on Studebaker chassis



Four-passenger coupe body built by E. J. Thompson Co. for Westcott

a good example of a wide variety of molding made by the same company for edging finish with fabric-covered quarter and rear panels.

Interesting exhibits of window regulators, door locks with improved locking devices, and body hardware were made by Perfection Window Regulator Co., Parsons Manufacturing Co., English & Mersick Co., National Seal Co., E. V. B. Co., Dura Co., Abeles-Lewit Co., Art Work Shop, Charles C. Blackmore Co., George R. Carter Co., Cleveland Hardware Co., Doehler Die Casting Co., Eberhard Manufacturing Co., O. M. Edwards Co., Inc., Mack Lock Co., Inc., Mitchell Specialty Co., Russell & Erwin Manufacturing Co., Soss Manufacturing Co., Stewart Manufacturing Co. Other exhibitors showed paint and varnish, leather, leather cloth, interior trimming cloth, and other materials of body construction.

Among those exhibiting materials of this kind were the following: American Chemical Paint Co., Black & Decker Manufacturing Co., Blocksom & Co., Sidney Blumenthal & Co., A. Boyriven, Bridgeport Coach Lace Co., Brunsene Co., A. S. Campbell Co., Carr Fastener Co., Cleveland Tanning Co., D'Arcy Spring Co., Dictograph Products Co., W. H. Duncan Co., Inc., Eagle-Ottawa Leather Co., FitzGibbon & Crisp., Inc., Gallaudet Aircraft Corp., Haskelite Manufacturing Corp., Laidlaw Co., Inc., Lesher-Whitman & Co., Inc., Louisville Bedding Co., Manning Abrasive Co., Marshall Metal Corporation, Minnesota Mining and Manufacturing Co., Murphy Varnish Co., Oxford Varnish Corporation, Pantasote Co., N. A. Petry Co., Inc., Radel Leather Manufacturing Co., R. E. Rodriguez, Sherwin-Williams Co., Texileather Co., Valentine & Co., Zapon Leather Cloth Co.

The Body Builders' Show this year is of more interest as an accessory and parts exhibit than as a style show. Since the public is likely to be more interested in the latter type exhibit, future shows will probably give more attention to design and style of completed bodies.

Efforts will be made next year, it is understood, to make the Body Builders' Show more complete as to body designs. The attempt will be to interest more fully the general public and the members of the industry visiting the New York Automobile Show. The Body Builders' Show has suffered in attendance because of the automobile show in the past, especially because of the numerous hotel and other exhibits, all of which make calls upon the time of the interested visitor.

Automobile Body Builders Hear Plea for Standardization

THE Automobile Body Builders' Association, at their annual meeting in New York on Jan. 12, discussed railroad freight rates, changed their by-laws to abolish the term "associate member," elected officers for the coming year, and listened to three excellent speeches, one a plea for standardization, and two dealing with topics affecting automotive business in 1923.

A plea for cooperation in the creation of body engineering standards formed the subject of a talk given by L. Clayton Hill, Assistant General Manager of the Society of Automotive Engineers. There are a great many details of body construction and hardware that are susceptible to standardization without interfering with the designer's individuality. Attention was called to the recommended practices already adopted by the S.A.E. on door lock handle squares, door flange widths, top iron threads, etc.

L. Clayton Hill made a plea for standardization to Automobile Body Builders Association.

Hill pointed out the importance of standardizing on certain types of rolled moldings. There is no need, he said, for fifty styles of drip moldings where two at most would suffice. The same is true of floor board, angle moldings and other similar parts.

There is the closest cooperation between the Automobile Body Builders' Association and the Society of Automotive Engineers in the work of body standardization. The committees of both organizations overlap, Hill said, and are always in contact. The A.B.B.A. Committee has submitted a number of valuable suggestions which have originated among the members of the Association for consideration by the Body Division of the S. A. E. Standards Committee.

Alfred Reeves, General Manager of the National Automobile Chamber of Commerce, told the body builders that there will always be a place in the automotive industry for the small concern, despite a tendency toward centralization.

John C. Howel of the Brookmire Economic Service spoke on "Financial and Business Conditions Affecting the Automobile Industry."

The following officers were elected: President, Francis D. Willoughby of the Willoughby Co.; First vice-president, A. W. Franz of the Waterloo Body Corp.; Second vice-president, L. P. Valentine of Valentine & Co.; Third vice-president, W. R. Laidlaw of The Laidlaw Co., Inc.

Automotive Industries
January 18, 1923

Manufacturers Must Help Dealers Solve Used Car Problem

Cancer in side of industry must be removed if sales organizations are to prosper. Boston plan giving some relief, but best system yet evolved merely keeps down losses. Time has come for factories to recognize obligations to men in field.

By Neal G. Adair
Editor of Motor World

IF anyone outside the automotive industry should ask anyone inside the industry why the tremendous production and sales year just closed was not a year of tremendous profits for dealers he would get an answer in two words: Used cars.

Dealers sold more than 2,000,000 new cars. But along with them they sold 1,200,000 to 1,500,000 used cars, and in a majority of cases did the work of selling both the new and used car for the new car profit, often for less. No one needs to be an expert accountant to figure the net result.

Dealers have been figuring this kind of net result for years but never before, generally speaking, with the keen appreciation that has dominated their thinking on the subject in the past year. A vast leaven of education has been working throughout the trade, from which has risen a wider understanding of the causes and extent of losses through used-car trading. The consequence, brought up to date, is this:

A great many dealers, while eager to do a greater business than last year, are determined to do it more profitably.

These dealers are taking part in cooperative plans to reduce used-car losses or are working with other dealers in their communities to bring cooperative plans into being.

The news that Boston dealers have cut their used-car losses almost $500,000 by means of a market-service information, maximum-allowance plan has electrified the automotive dealer world. No one has seen any hats thrown in the air nor heard any cheering, but the electrification has occurred, just the same.

Philadelphia, Baltimore, Syracuse and Newark, in the big city class, have adopted the Boston plan, and numerous other large and small cities have gone into it or are about to do so.

NEW YORK, whose dealers—branch managers and distributors, to be exact—have talked for long years about the impossibility of used-car cooperation *in New York*, has a committee working out the details of a slightly modified Boston plan for the metropolis, with Brooklyn dealers virtually lined up either to participate in a single greater city cooperative effort or to establish a separate organization of their own. And it is significant that among the most active promoters and supporters of the movement in New York are managers of factory branches, managers for manufacturers, apparently, whose New York branches are not regarded primarily as advertisements but as business houses expected to pay their way and earn profits.

The Boston plan has a maximum allowance feature. The rest of the plan, that is the weekly exchange among dealers of information on actual sale prices of used cars, is in operation in such large distribution centers as Detroit, Cleveland, St. Louis, Kansas City and many others that might be mentioned.

Organized effort to establish definite market values for used automobiles, thus discouraging over-allowances, has become a countrywide movement.

In this movement, whose growing strength cannot be left out of studies of the future of motor-car merchandising, many manufacturers have been mere onlookers. In some cases they have not shown enough interest to look on. In some others a "hands-off" policy, tacitly encouraging distributors or branch managers to enter a cooperative plan, has helped the movement on its way. In a few instances factory opposition has fed the fire of dealer indignation over what they term the willingness of the manufacturers they serve to let the dealer "hold the bag" on used-car losses.

THE movement has been from the first a dealer movement, born of near desperation and nursed from infancy to a lusty if not wholly healthy childhood by dealer determination to find some way out of the used-car dilemma.

It was not for want of something else to talk about that half a hundred dealer association managers, executives of some of the largest city associations in the country, spent two days in Chicago in September discussing used-car cooperation. This was the National Used-Car Conference conducted by the National Association of Automobile Show and Association Managers, which turned the light of national publicity on the Boston plan.

It was not for lack of something else to occupy their time that delegations of distributors and dealers from many cities went on pilgrimages to Boston after this Chicago conference, to study the Boston plan on its home grounds and, in several cases, to take back reports that led to its adoption in their cities. And it may be said that Boston is gaining rather than losing in its position as a Mecca for would-be used-car cooperators as time goes on.

It was not for want of a better subject that officers of the National Automobile Dealers Association decided to devote half of a two-day convention in Chicago in February to a used-car forum, which will again focus the spotlight

on the Boston plan, its predecessor, the Saginaw plan, and on the used-car merchandising methods of individual dealers, which also were studied at the earlier conference of the association managers.

This yearning for light on the darkness of the used-car problem, this determination to do something about it, have not just happened. It is the outgrowth of demand that conditions surrounding the buying and selling of used cars by the trade be so changed that legitimate profits may be assured.

BEFORE the manufacturers' side of the question is considered it will be worth while to look more closely into the Boston plan, which without question is the center of attention of every man in the trade looking for relief from his used-car burden.

Eighty distributor, branch and dealer organizations are cooperating in the Boston plan. There is a central bureau, supported by the cooperators, which receives weekly reports of used-car purchases and sales, with purchase and reconditioning costs and sale prices and incidental information necessary to complete the picture of the used-car market. The weekly reports, reduced to tabulations, are furnished to all the cooperators, so that they have facts on the condition of the used-car market, most important, of course, on the prices the public is paying for used cars of various makes and models.

On these reports are based the maximum allowance lists contained in a little black book which is revised whenever sale price reports or new-car price reductions make it necessary. The black book, supplemented by the weekly reports of actual sale prices, is the dealer's guide. He doesn't have to guess. He knows how much he can allow for a used car of any make or model and get out with a whole skin. It may be said that a good merchant would have these facts from a study of his own books, but the constant hammering of the weekly report has accomplished reform in many dealerships where the lesson of the ledger, though known and understood, has not been consistently heeded.

THIS article is a frank exposition of what dealers generally feel manufacturers owe them in seeking a solution of the most pressing problem confronting them. It is written by a man who has studied the question from every angle in an earnest effort to serve the readers of Motor World.

The used car is just as much a manufacturer's as a dealer's problem, and the time has come when factories must assume some of the burden if their dealer organizations are not to melt away. Adair makes some constructive suggestions for preliminary steps.

The Boston plan saved the cooperating dealers almost $500,000 in 1922, when their used-car losses were compared with those of the previous year. But an insight into the used-car issue is given when it is learned that, despite the lowered allowances brought about by co-operation, the trade in Boston is still losing money on used cars.

A report of the Boston Used-Car Statistical Bureau for its eleven months of operation shows the following figures:

Used cars taken and resold	6,519
Total allowances	$4,972,034
Total repairs	332,403
Total allowances and repairs	5,304,438
Total sales	5,435,676
Excess of sale prices over allowance and repair costs	131,238

Figured out on a percentage basis, the gross profit on all these transactions was 2.41 per cent.

The net necessarily was a loss, considering the insurance, storage, interest, advertising and selling costs involved. It is difficult to conceive the net loss being less than 10 per cent, or $431,000, and it is more than likely that these Boston dealers, while they save themselves $500,000 by cooperation, still lost another $500,000 on used cars as a result of conditions beyond their control. And all this with the cooperating dealers not only holding themselves within but often allowing far below the maximum allowances stated in the book.

The black book has become somewhat of a Bible in the Boston trade and throughout New England, because with only eighty dealers cooperating in the plan, more than 1200 books have been purchased by the trade throughout the Northeast. Other New England cities are using the plan in whole or in part, and in New Hampshire the dealers of the entire State recently cooperated in a campaign of newspaper advertising intended to educate the public on true used-car values.

Boston dealers do not claim that their plan is working perfectly nor has perfection been attained in any of the other cities where it is employed. But it is the only outstanding relief measure in sight, and it has accomplished and is accomplishing something.

An official report of the bureau late in the summer showed that the dealers were allowing themselves on an average $5.25 per car taken in at $762, for overhead and selling expense. Early in the fall the dealer margin had been raised to $16.22, and in a report issued Jan. 1 the figure was $20.13. Anyone will admit this improvement is worth while—and the bureau in its educational work is trying to induce its members to bring the margin up to $76, or 10 per cent gross per car.

Many individual dealers, some in Boston some elsewhere, have bettered the Boston figures, but we don't know of an entire community that has such a record.

No wonder, in addition to sending delegations to Boston, dealer associations, including the National, are importuning the Boston bureau to loan its secretary for speech-making purposes, to the extent that a schedule of two or three meetings a week, some of them hundreds of miles from the Hub, has come to be regarded as the usual thing.

"It's a dealer problem," manufacturers have been saying of the used-car issue. Accepting the statement not necessarily as truth but as the opinion of men in authority, dealers in Saginaw, Mich., lighted more than seven years ago the little candle of the first maximum allowance plan, of which the Boston arc light is the logical successor. The rays of the Boston light are traveling fast and far and by sheer force of resultant circumstances they are bringing the industry to a realization that "it's a dealer problem" is not a complete alibi.

IT is significant that manufacturers here and there have openly classed the used-car issue as one of industry-wide rather than mere dealer proportions. If more and more dealers—as what is going on in the trade indicates—reach the determination that they will not suffer used-car losses and limit their new-car sales to sales they can make at full profits, the acceptance of the industry-wide nature of the problem will become more general.

There is no intention to set down here a prescription that will enable the manufacturer to cure this serious illness of the trade. No single factor in the industry

can cure it. The problem cannot be worked out overnight, but there is a place to begin.

First, the manufacturer not only should concede the fact but should impress upon his dealer organization that it costs just as much to sell a used car as a new one. Plenty of arguments have been offered to the contrary but they won't hold water. If a dealer has no more than a fair margin of net profit left after he has stored, prepared for delivery, insured, advertised and paid a selling commission on a new car with a 20 or 25 per cent gross discount surely he cannot go through the same motions for the used car on a lesser margin. Yet thousands of dealers try to turn over used cars on a gross margin of 10 per cent and many more thousands without any gross margin at all, and some manufacturers not only let them go on in ignorance of this fatal error, but by pressure of new-car shipments encourage them in it, sometimes force them into it. Manufacturers, with greater opportunity for study of the fundamentals of business than the rank and file of the dealer body, ought to be actively engaged in educational work intended to turn the light on the facts of gross and net profit, particularly as they apply to used-car merchandising.

A few manufacturers, it may be said, have contributed, some of them vigorously and constructively, to such education.

As an aid to this educational work, the manufacturers could eliminate one of the chief causes of demoralization in the used-car market by discontinuing the practice of allowing trading discounts. These are not numerous at this time, several manufacturers having done away with them in the past year, but there are still enough of them to foster a false basis of competition which often has been the undoing of dealers with such discounts as well as competitors without them. If a manufacturer, because of the discontinuance of a model, must quickly dispose of a stock of cars, why shouldn't he permit his dealers to cut the price and frankly tell their prospects why they are cutting it?

IF he conceals from purchasers the fact that the model is to be superseded he builds up an ugly structure of ill-will on a foundation of deceit. Even if he instructs his dealers to tell the truth, this roundabout way of making a price concession, by an inflated allowance on used cars, adds just so much to the now too sufficiently embedded public notion that the automobile business is a "horse-swapping" business, and that automobiles are worth what dealers can get for them, which is likely to vary in some cases hundreds of dollars in different communities and at different times of year.

There is no call for a policy of standard discounts; merchandising some cars requires larger commissions than others. But the "inside" discount, temporarily adopted for reasons of expediency, is one of the most annoying disturbers of trade conditions. Under the Boston plan, as an instance, a dealer enabled to cut his price for any special reason, tells his prospects of the reduction instead of camouflaging it by an excessive allowance on the used car.

THE condition of the trade also calls for education in salesmanship. There are men who contend that if cars, new and used, were sold with the intelligence that such a product deserves, there would be no used-car problem. Certainly it would be much less serious. A big city retail salesman recently made himself a sales manual, because neither the branch for which he worked nor the manufacturer behind the branch had furnished the information he needed properly to sell his car. Who better than its makers can say how a car should be sold, yet how many among the manufacturers have ever put the story down in words and pictures in a single volume that would serve as a salesman's universal reference book? Better sales education would help to lighten the used-car burden.

Finally, if the figures from Boston mean anything, the manufacturer owes to the dealer and the dealer more and more insistently is going to require of the manufacturer, keener study of the demand of the dealer's territory for motor-car transportation, which includes used cars right alongside new cars. If a dealer last year delivered 200 new cars by allowing so much on old ones that his new-car profits were cut down by 50 or 25 or 10 per cent, or any per cent at all, 200 cars was an excessive quota. The manufacturer undeniably moved 200 cars into that territory but he was not building a permanent, loyal unit in his dealer organization—and a year or two or five years from now the 200 cars he disposed of last year won't be putting any profits in his pocket.

The used-car issue, among others, is teaching the industry that the dealer body is the foundation of its existence and prosperity. This will be more and more plainly demonstrated as production and competition increase and the buyer becomes more and more the dictator of distribution. Those in the manufacturing field who see most keenly the danger signals in a big production-small profit year such as 1922 and who undertake most promptly and thoroughly the building of profit-making dealer organizations will be the leaders of tomorrow.

New Glider Record of 7 hrs. 3 min.

THE plane used by Lieut. Thoret in establishing the world's record flight of 7 hr. 3 min. without the use of its engine is a Hanriot Type 14 with a total surface of 366 sq. ft. and a weight of 1366 lb. The engine, an 80-hp. Gnome & Rhone, weighed 176 lb., and only sufficient gasoline was carried aboard to assure a take off. The wing load per square foot was 3.7 lb.

The flight was made near Biskra, in southern Algeria, above a hill about 800 ft. high, against a wind blowing from 15 to 25 miles an hour. Toward the end of the flight the wind increased to more than 30 miles an hour. Before making his record flight, Thoret had remained in the air on the same machine with a passenger aboard and the engine throttled down to 450 revolutions, which is equivalent to about 30 hp. The flight of the French officer indicates the possibility of making aerial journeys, under certain favorable conditions, with the engine either throttled down to a low number of revolutions, or stopped altogether. Maneyrol, the French aviator who held the previous gliding record is preparing a new glider fitted with a 3-hp. Gnome & Rhone twin-cylinder air-cooled engine to be made use of for getting off the ground and for remaining in the air only when sustaining currents fail.

Let Truck Take Short Haul Traffic Is Advice of Elisha Lee

Vice president of Pennsylvania Railroad declares there is big place for commercial vehicle in transportation system. Advocates pick-up service in larger cities for l.c.l. freight. Pictures ideal gasoline rail car.

By Elisha Lee*

I FIND a deep source of satisfaction and assurance in the thought that you have asked a railroad man to address you during the course of your Society's annual meeting, and, I believe, as the only speaker outside the ranks of your own profession. May I express the hope that this will serve to symbolize the idea that the railroad and the motor vehicle are not rivals seeking to crowd each other out of the field of patronage, but are agencies capable of developing side by side and of finding their own broadest field in joining resources for the perfecting and rounding out of the public service of transportation.

At the outset I wish to express my most sincere and profound admiration for the magnificent achievements of the American motor industry. The story of those achievements, practically all wrought in the short space of twenty years, and a large proportion of them in less than ten, constitute a record for the marvelously swift creation of new wealth, capital and work, and for the elevation of the living standards and ambitions of many millions of people, which I believe cannot be paralleled in history.

In making that statement, I do not sacrifice any of the pride I have always felt in my own calling, and in the railroads as the great arteries of the nation's life. But I am obliged to realize that within two decades the American automotive industry has risen from practically nothing until today, with all its operating vehicles, its manufacturing plants, its selling establishments, its fuel, storage, service and repair stations, it represents, according to the estimates of your organizations, a substantially greater investment of capital than do the railroads and employs more hands—in these respects outstripping the growth of the railroads over nine decades.

THOSE are facts to which none of us should shut our eyes, least of all railroad managers. They are also facts from which we should be very careful to avoid drawing dangerously wrong conclusions. One of these conclusions, which from its novelty and spectacular appeal commends itself only too easily to a good many people is that motor vehicles and concrete highways are destined to erase the railroads from the map. The truth, I believe, is that they are destined to add very greatly to the utility and efficiency of the railroads by rounding out and completing the rail service and relieving the railroads of certain forms of service which are burdensome and costly when performed over fixed tracks and with the necessarily heavy equipment of the steam lines, but can be made attractively profitable to the loose-footed, free-moving motor car. This is the aspect of the matter toward which, in my opinion, both the motor industry and the railroads, in their own true interests and in the interest of transportation progress should endeavor to guide public thought and discussion.

The part of the motor vehicle, in rendering transportation for hire, is not to do what the railroad is already fitted and equipped to do with full success and satisfaction; it is to do what the railroad is not able to do at all, or else does only with difficulty and imperfect success.

EVENTS to the present time certainly bear out that view. There are now stated to be nearly 12,000,000 motor vehicles in the United States, all busily engaged in producing transportation in enormous volume. Yet since 1900, when the motor industry may be regarded as having its rise, the freight traffic on our railroads, measured in tons and passengers carried one mile, nearly tripled. In the last three years the demands for transportation made upon our railroads have exceeded those of any previous era, and it is common knowledge that the question how to increase the carrying capacity of the railroads is the nation's most pressing economic problem at the present time.

We thus have what superficially seems to be an anomaly in the rise of an immense new transportation agency coming simultaneously with unprecedented demands upon the services of the older agency. The explanation, of course, is the quite obvious fact that the vast bulk of the transportation rendered by motor vehicles is in entirely new fields. It constitutes additions to, rather than substitutions for, that previously rendered by the railroads. For that reason, when the new business booms developed, the railroads felt the pressure almost as though commercial motor transport did not exist. Indeed, the vast impetus to motor car building in the last few years was one of the most notable causes of the increased demand upon the railroads for service. So we have another interesting situation in the fact that the expansion of a new agency of transportation has actually added greatly to the demands upon the old.

**Abstract of address delivered by prominent railroad executive at the annual dinner of the Society of Automotive Engineers in New York.*

In discussing the relationship of motor transport to the railroads we necessarily have in mind the future possibilities for the further development of motor vehicles in the field of transportation for hire. I, of course, share the realization of railroad officers, generally, that this activity, although already of important scope, is still in a state of comparative infancy and is entering upon what should be a period of lusty and vigorous growth. Nevertheless, I have already indicated the opinion that the resulting problems, as relating to the railroads, will not, except in secondary degree, be those of competition, but will chiefly be those of coordination.

FOR holding those views I have a very simple reason. Such profits as the railroads are able to make at all come practically altogether from the mass transportation of freight and passengers over at least considerable distances—in other words, from what we may term the "wholesale" departments of transportation. This is just the form of service in which experience shows that trucks cannot consistently earn real profits. On the other hand, those forms in which trucks can and do make money are almost invariably the strictly "retail" forms in the rendering of which railroad operation practically always involves losses and sometimes very heavy ones.

The question of competition in reality seems seriously important from only one point of view and that is to enlist the assistance of the leaders in the automotive industries in discouraging futile attempts at losing forms of competition. Such experiments are harmful in two ways. They reduce railroad earnings while they last and waste and dissipate the energies of truck operators which might be utilized in productive channels.

I am satisfied that the railroads and their patrons urgently need the cooperative services of both motor trucks and motor passenger lines and can therefore ill afford to see these forms of enterprise go to waste in fruitless and needless efforts at competition with transportation agencies which are already functioning successfully.

I am going to endeavor to lay before you some of the specific ways in which it seems to me promising opportunities lie for bringing about a coordination of motor and rail services, with resulting advantages to both, as well as to the using public. Please consider my views broadly, as being personal conclusions and not as necessarily representing formally adopted policies of the railroad system with which I am associated or of the railroads in general.

Presumably, we all agree that, as a fundamental to any constructive approach, there must be open-mindedness on both sides. Automotive interests must cease to defend or encourage cut-throat sporadic forms of competition, while the railroads must be ready to relinquish to the motor trucks and passenger buses those forms of service in which the latter can clearly demonstrate superiority. There are truck dealers who will sell almost anyone a truck on installments to operate almost anywhere, regardless whether the venture is sound or not. Such a policy, which is certainly within the power of the manufacturing interests to curb or correct, is neither more nor less shortsighted than that of the unprogressive railroad official who blindly refuses to surrender a dollar of gross revenue, regardless of net results, on the principle that a railroad can never afford to give up anything or recede from any field.

It seems to me that one of the most important opportunities for useful and successful coordination of motor and rail facilities may be expected to lie in organizing smooth-working freight pick-up delivery motor services in the larger cities, for the less-than-carload traffic, to be operated in connection with inter-city hauls by rail. Such an arrangement would extend the scope of rail transportation by making it a really complete service from the premises of the shipper to the premises of the consignee. It would allot to each transportation agency employed the portion of the service which each is preeminently fitted to perform—to the truck the terminal work and to the railroad the line haul.

This subject is of vital importance to the railroads, their patrons and the makers of motor vehicles, alike. If such a service could be worked out for the larger centers of the country generally it would constitute one of the most momentous advances ever made in the handling of railroad traffic and would create an economically sound market for the product of motor truck makers.

In approaching this question it may be noted that the tendency usually is to dwell largely upon the possibilities of reducing the cost of distribution through the establishment of such a system of store-door collection and delivery, in the sense of making possible a structure of through rates which would be lower than the combination of the existing rail rates plus the present costs of collection and delivery at each end. It may doubted whether that is really the best "selling point" upon which the automotive interests should focus attention, or whether it is actually capable of immediate realization.

It must be remembered that to inaugurate a service such as we are talking about, it will be necessary to enlist the aid of considerable new capital. A service of the character contemplated would certainly be a vast improvement over the haphazard facilities for collection and delivery now usually at the disposal of shippers and consignees who do not have their own trucks. It would constitute a notable addition to the present service and should be worth a fair and reasonable price. It is difficult to see upon what other basis the needed capital can be attracted.

IN convenience and speed such a service would lie midway between the present ordinary freight and the express. It would be substantially a semi-express service, affording complete through transportation, rendered by a combination of motor truck and freight train instead of by a combination of truck and passenger train. The aggregate charges would of necessity have to be adjusted in proper recognition of its character, always

DEEPLY significant of the changing attitude of the railroads toward the motor vehicle was the address of Elisha Lee before the Society of Automotive Engineers. One of the leaders of railroad thought, he has reached the conclusion that the carriers should surrender less than carload lot, short haul freight and some short haul passenger traffic to trucks and buses. He believes there is a big place for them in the field of transportation.

The opinions voiced by Lee are virtually the same as those expressed by W. H. Lyford, vice-president of the Chicago & Eastern Illinois Railroad, at the highway education conference in Washington.

bearing in mind that new capital must be attracted if trucks are to be purchased and operated.

There would be many very real economies and savings outside of the rates themselves. Among them may be enumerated the greater certainty and dependability of service, the reduction in losses in transit, lower insurance rates, greater ease in making shipping arrangements and paying bills and a reduction in the time goods are on the way, which would amount to a saving of interest on idle capital. The shortening of the time in transit would also permit the carrying on of business with smaller stocks, thus in another way reducing capital charges.

Independent Operation Advisable

The question arises whether a terminal trucking system of the kind we have been discussing should be operated by the railroad companies or by independent enterprises working in cooperation with them. This question would require careful study to be answered decisively, but in the light of present knowledge there appear to be at least two important considerations favoring independent operation.

One is that the railroad business is already so vastly complicated that it is very debatable whether it is desirable to add another department requiring expert knowledge, to the functions and duties of management.

The other is that, if identified with the railroads in ownership, the trucking operations would be more likely to be subjected to hampering and restrictive regulation than if independent.

Should there be a single trucking agency in each city, or several more or less competitive? The former seems to be the general rule in England where, by the way, the collection and delivery system appears to have been working out very successfully. For us I am not certain that the single or unified agency scheme is the best. Without committing myself definitely, I may say that there seem to be at least some good arguments for preserving a degree of competition and also for maintaining the identity, all the way through, of the services of the separate railroad lines. That identity would be largely lost if every shipper and consignee, in a given city, transacted all transportation business through the same local collection and delivery agency. On the other hand, if there were separate agencies cooperating with each separate line of railroad, the identity and individuality of the various rail lines and of their services would be preserved.

There seems to be a positive mania today for building long-distance automobile and motor truck roads, whereas the more urgent need is probably for shorter distance lateral highways, bringing the more remote villages and countryside into better communication with the larger towns and railroad centers.

This same policy also has an important bearing upon the possibilities of extending motor bus service for passengers into the territories not already served by railroads or by interurban electric lines. Our new highways, inviting motor travel, are not being built in those directions for the most part. Instead, thousands of miles of concrete and other expensive roadways have been built and are under construction, paralleling the lines of the trunk line railroads. These highways are the great routes of the longer distance motor buses. Their coming does not assist in giving transportation service to people who previously had none.

To make matters worse, in many cases, especially in the Central West, the rail lines had already been paralleled years ago by interurban trolleys so that the advent of the concrete road and its bus lines often simply provides a third agency of transportation where one would suffice. Thus, with a serious shortage of transportation for the country as a whole, we are confronted with a remarkable excess of facilities in certain instances.

Before coming here tonight I was requested to discuss the adaptability of motor-driven rail cars for passenger service on existing branch railroad lines of light traffic. My reply must be that the real answer to this question lies in the hands of the automotive engineers themselves. The railroad with which I am associated is carefully studying every new design brought out, as are many of the other roads, also. But thus far the type has not been produced which we can regard as fully and satisfactorily solving the problem. However, we are proceeding to give a practical try-out to a number of cars of the most promising type yet produced and other lines are following a similar course.

I can give briefly the specifications of what the successful gasoline rail car must, from the railroad manager's viewpoint, be and do to meet with reasonable completeness the needs of light branch line traffic. It must be capable of carrying 70 to 80 or more passengers, with suitable baggage, mail and express space. It must be capable of a sustained speed on level track or ordinary grades of at least 40 miles per hour. It must be reversible and capable of operation from either end. It is needless for me to say that the problem resolves itself largely into the designing of a motor of sufficient power—probably at least 100 hp.—with the necessary mechanical and electrical equipment that will allow control from either end and movement in either direction. That problem is in the hands of your profession. I have no doubt that it will be solved.

There is just one more subject upon which I would like to touch, and that is the question as to the limits of distance within which the motor truck, instead of acting jointly with the railroad, may be regarded as fitted to take over merchandise freight service in its entirety. In my opinion, all freight service within city and highly developed suburban areas should be performed entirely by truck, except those special cases involving single pieces of such great weight as to necessitate the use of railroad equipment and roadbed. Otherwise the railroads ought to be relieved altogether of intra-city business, so that the tracks within the municipal areas may be reserved entirely for the purposes for which they were constructed, namely, the rendering of the strictly terminal service required in connection with the line hauls.

Trucks for 25-Mile Hauls

Outside of the strictly cosmopolitan districts the question of determining the economic limits of truck operation resolves itself into one of determining the point at which the cheaper costs of truck service within terminal zones begin to be overcome by the greater efficiency of line haul by railroad. The distance would naturally differ for every center. Possibly it may sometime have to be designated more or less arbitrarily, for every cosmopolitan district, by regulative authority. Possibly a fair average distance might be 25 miles.

There is only one further thought which I wish to leave with you. The spirit in which all of our problems of coordination ought to be approached should be one of live and let live. For both the men in your occupation and mine, the primary purpose should be to guide the development of that relationship along sane and sensible lines, so that each form of transportation may be enabled to give to humanity the maximum service of which it is capable."

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Quotes Isaiah To Prove Highway Need

UNDER the caption, "Lift Up a Standard for the People," quoting from the prophet Isaiah, the *Manufacturers' Record* prints on its front cover the following really constructive editorial on the subject of highways:

"The highway is the standard by which a people can be judged. It measures the economic advancement of a country. It measures the awakened interest in education and in religious activity. The highway tells the story as to whether a people are willing to live shut out from their neighbors, and shut out from economic advancement, gradually drifting backward; or else leaving the region of bad highways in order to give to their families the things which every family has a right to demand to the extent of the ability of its head to provide. And if a community will not provide good highways it is the bounden duty of men to take their families into other sections where the good highway opens to the women and children the opportunities for a broader life, for the higher upbuilding of character, for a wider vision of world affairs and for a chance for success in the battle of life when measured only on the plane of economic opportunity.

"The country boy or girl content to live on impassable roads by that very fact proves that he or she has not the ambition to succeed in life; that there is something lacking in their makeup which, unless their natures be completely changed, will chain them through life to the dull, dreary plodding of a dismally uninteresting and unprofitable existence. Such people cannot possibly take a right view of the higher and holier things of life. They cannot vision world conditions. They cannot step beyond the narrow circle which darkens their horizon and keeps them forever held by mental and economic enslavement.

"This issue of the *Manufacturers' Record* is largely devoted to the importance of good highways and to telling the story of what highways mean for the advancement of humanity. We are doing this with a firm conviction that he who does the most for the advancement of the building of highways is doing the most for the upbuilding, the uplifting of the people and for holding aloft a standard which points to larger opportunities and to a higher life."

Good Trade Associations

LEGITIMATE trade association activities have been placed on a more substantial basis by the decision of Federal Judge Hand in the restraint of trade case instituted by the attorney general against the Gypsum Trade Association. Under it the association will be prohibited from price fixing and other illegal activities, but will be permitted to continue work which does not come into conflict with a reasonable interpretation of the Sherman law.

The decree prohibited automatically the fixing of prices, the making of agreements among members for the advance or decrease of prices, division of territory among members, transfer of credit lists for the purpose of blacklisting creditors and the limitation or control of output.

None of these inhibitions will conflict in the slightest degree with any of the work which is being done by the trade associations within the automotive industry. These organizations have been sanely as well as efficiently managed and there has been no desire on the part of any one of these automotive associations to engage in practices which might lead to the limitation or restraint of trade.

Automotive associations are operating along lines thoroughly approved by Secretary Hoover and not opposed by Attorney General Daugherty. In this respect the industry is fortunate and the decision of Judge Hand that there is a distinct field for such associations will clear away whatever atmosphere of doubt may remain in the minds of some persons on this subject.

Railroads Approach Conference Stage

MANUFACTURERS and operators of commercial vehicles will find much of interest to them in the address of Elisha Lee, vice president of the Pennsylvania Railroad, at the annual dinner of the Society of Automotive Engineers, which appears elsewhere in this issue.

His views on the necessity for co-operation between the railroads and motor vehicles are of especial significance because he speaks with authority as one of the leaders of thought among railroad executives. When he says the steam lines should surrender to the truck most of the short haul, less than carload lot freight business, and to the motor bus some of the short haul passenger traffic, it is indicative of a more liberal and more constructive attitude.

The bitter antagonism towards motor vehicles so long manifested by the railroads has no economic justification. There are no inherent obstacles to cooperative effort. Development of the country has been retarded by a lack of adequate transportation and full advantage must be taken of every means available. Lee himself points out that notwithstanding the marvelous development of the automotive industry, the volume of business offered the carriers is greater than ever before.

So far as visualizing the most profitable field for the operation of motor trucks is concerned, Lee is no Columbus. The automotive industry long has insisted that it was to be found in the handling of short haul, l. c. l. freight, especially in congested urban districts. This is the automotive platform, and it is broad enough for the railroads to stand on.

When two interests agree on fundamental principles it seems foolish for them to squabble. Long distance sharp shooting never settled definitely any really important issue. Railroad riflemen have been firing anti-motor vehicle propaganda for a long time, but it seldom has hit the target. This method of attack is especially vicious at a time when the railroads have begun to realize that the motor vehicle can perform efficiently a service they can't.

This guerrilla warfare with half-truths, falsehoods, and "bunk" as ammunition hasn't and can't prevent wider use of the motor vehicle as a means of transportation. If agreement can be reached on the main points involved, and agreement does not seem far distant, there are no insuperable differences which cannot be overcome if representatives of the railroads and the automotive industry will get together around a conference table.

Traction interests have realized the futility of a blind assault upon the motor vehicle. They are learning rapidly that what they once looked upon as an unscrupulous and dangerous competitor can be converted into a valuable ally and friend. The steam roads eventually will learn the same lesson. It is significant that the views Lee holds now are almost identical with those expressed by W. H. Lyford, vice president of the Chicago & Eastern Illinois, at the Washington conference on highway education. Lyford is one of the keenest students in the United States of the relations railroads should have with motor vehicles.

While the industry can subscribe gladly to most of the views of Lee, some of his contentions are indefensible. One point in this category is that rail lines should not be paralleled by improved roads. This idea was discussed by AUTOMOTIVE INDUSTRIES when it was voiced by President Harding.

Lee has been misinformed regarding the emphasis which is being placed upon the construction of high speed trans-continental highways. If he were to go to Washington and study the program of the Bureau of Public Roads, he would find that the major portion of federal highway funds is being expended for the construction of roads which will bring the farmer and his market closer together, thereby serving as feeders for the railroads.

The automotive industry has no quarrel with this program. Most of the main line highways now have about all the motor vehicle traffic they can carry. Expansion of the automotive market will be served best by the opening up of new territory not now served by improved highways. It is on such roads as these that most of the new prospects will be found, and the industry is in thorough accord with the policy of the Bureau of Roads.

A few addresses like that of Lee will go far to clear away the fog of misunderstanding. He has sensed the economic possibilities of the commercial vehicle as an agency of transportation. He has voiced his views sanely and dispassionately. The railroads and the automotive industry are not so far apart, and it is possible 1923 will see them cooperating to coordinate these two great phases of transportation.

Hawkins Flays National Shows

General Motors Executive Declares New York Exhibition Accomplished Little That Could Not Have Been Obtained by Sound Business Methods and at Less Expense—Believes Dealers Do Not Have to Be Dined and Entertained to Secure Their Interest

By Norval A. Hawkins
Sales, Advertising and Service, General Motors Corp.

DETROIT, Jan. 17.

NATIONAL automobile shows, as held in recent years and as exemplified by the latest New York show, typify the extravagant methods which characterized the industry in its period of early growth. Under present conditions it would be very difficult, I think, for any company to justify, by any tangible return, the expenditures entailed by the New York show and activities directly related to that highly colored affair.

The New York show, as I saw it, accomplished little or nothing that could not have been accomplished by sound business methods at much less expense. I take it for granted that men who are responsible for merchandising motor cars are "sales" men rather than "show" men.

In the early days the New York show served to attract dealers from all parts of the country and provided a convenient means of making dealer contracts. Today automobile companies which are properly organized have a staff of men who carry on such work in a systematic and orderly way. Good dealers do not need to be brought to New York and treated to a series of cabaret performances for the purpose of inducing them to take on a reputable line of cars.

So far as the general public is concerned, there may be some benefit from the focusing of New York's attention on motor cars, but I doubt if the automobile business, in a large sense, is improved by having people pass from car to car as if they were in a zoo with a tiger in one cage and a rhinoceros in the next.

Such methods must have a confusing effect, many buyers being left with a multiplicity of impressions which would increase the difficulty of making an intelligent selection as a rule. The moulding of opinion favorable to a certain make of car is a process which requires time and careful handling. There may be an occasional buyer who makes a decision as a result of an automobile show, but occasional buyers do not justify the expense of shows.

Assuming that it is desirable to have an automobile show week, I believe it could be made more effective and less expensive by staging each make of car in the retail establishment devoted to that particular line. Most buyers are no longer interested in the details of chassis construction. They are interested in body lines, upholstering, fittings, finish and appointments. It was quite evident that the principal interest at the New York show was in this direction. Doesn't that point strongly to the advantage of deliberate inspection in the individual show room.

As usual, the New York daily newspapers passed down the reception line of space buyers, each solicitor carrying the trumpet of publicity in one hand and the collection box in the other. Pages upon pages of valuable space were consumed in creating a blur of impressions from which no company could possibly derive any permanent good. Add to this scores of expensive banquets, tables provided with too much food and entertainers none too modest and you have a picture which does not present the industry in a constructive light. Once it was considered necessary to do this business as a game, but today it is no longer necessary or even justifiable.

It is very desirable to bring dealers together in a pleasant fashion when there is some definite message which is important for them to hear. Such meetings can be held at central points throughout the country without undue extravagance and with better provision for getting things done.

If conditions warrant the public display of various makes of cars, this could be arranged by establishing in Detroit a permanent exhibition which would represent the industry as a whole. As new models were brought out they could take the place of the old ones. Dealers interested in looking over different lines could have access to such an exhibit all the year round. Such an exhibition could have dignity and character more in keeping with the importance of an industry which now takes first place in the world's output of finished goods.

Ford to Offer Coal to Other Companies

DETROIT, Jan. 17—With the completion of a series of purchases which gives it control of large coal producing properties, the Ford Motor Co. is working out a plan of operations which will provide it with an excess over requirements for its own needs, and in compliance with its established policy, the company will offer the excess to those manufacturing companies from which it buys parts, equipment and material.

Officials declare that the company has no intention of entering the coal business, but that the economic operation of its coal yards will yield a supply over its own needs and this supply will be sold. The excess will not be sufficient to meet the needs of more than a small number of its supply sources, it was declared, so that there will not be a turnover for the general market.

Deliveries of coal to others will be available when there is a more ample supply of railroad rolling stock. At present, the company has cars enough only to meet its own needs. As present contracts for coal expire, the supply sources may make contracts with the Ford company, but this again is subject to the availability of rail cars. By March 1 the company will be in a position to make deliveries, other conditions being right.

Price on coal will be governed entirely by mining costs, and the company will not be guided in any way by existing market prices. Methods of mining will be modernized, and the properties administered according to the basic principles of operations in all Ford properties.

NASH'S LAST HALF YEAR BEST

KENOSHA, WIS., Jan. 15 — Nash Motors Co. reports more orders on hand Jan. 9 for delivery this month than were booked in any previous month in the history of the company with the exception of May and June of last year. Total sales of Nash passenger cars in 1922 more than doubled shipments made the previous year.

Show Results in Earlier Shipments

Buying Tone Rouses Interest of Dealers

Greater Stocking of Cars Evident —Changes Are Made in Retail Forces

NEW YORK, Jan. 13—As a means of arousing dealer interest and of procuring actual releases for the immediate shipment of cars the New York show has been entirely successful, factory sales heads report. Dealers in the metropolitan district have been enabled to make many sales at retail and the buying atmosphere at the show has encouraged the out-of-town men to stock up a little more heavily than their pre-show caution would permit.

Executives state that while practically all of the shipping specifications for the first months of the year were made out before the show began, the dates of these have been advanced so that business will get a stronger start. This with new dealers signed up by almost all companies will enable the factories to keep down waiting lists later.

Changing of Dealers

There was considerable changing around of dealers during the show and a great deal of signing dealers to take on lines additional to those they carried. This is particularly true of companies making cars in the $1,000 class exclusively.

Companies making lines of cars extending from the medium low priced field into the medium high priced field have been winning over dealers to some extent who previously handled either individual or several individual lines, and the tendency to change lines seems to run more in this direction. This does not hold true of the larger centers, but dealers in smaller towns seem to want complete lines where obtainable.

Dinner meetings during the week brought dealers from all sections into contact with each other, and the general result has been an improvement in morale. The contact with factory officials, too, had a strengthening influence which is reflected by the advancement and increasing of shipping dates. At many of the dealer meetings, bankers were brought in to visualize the strength in numbers of sales organizations.

The general feeling of optimism has made an impression on bankers, executives declare, and they look for a fuller measure of bank cooperation than has been extended in the past several years. This is especially true of some of the companies who had not been very high in banking favor formerly and will tend to break down, to some extent, the gradual concentration of buying in a few selected lines.

The recruiting of some dealers from other lines of business was reported, but the general expression was that most of the new dealers signed were won over from other lines by good selling on the part of the factory forces.

Business in Brief

NEW YORK, Jan. 16—Business has shown a quick revival from the lethargy of the holiday season, especially in a retail way, clearance sales moving a lot of stock, while jobbers report a fair amount of spring ordering. Collections are brisk, and the general public has been quick to pay for its Christmas purchases.

In the iron and steel industry there is considerable life and large additional orders are expected from the railroads and the automobile manufacturers. Pig iron is firmer and scrap iron higher, while there is free buying of bars, plates, sheets and structural material.

A decline in hides has freshened the shoe market, encouraging makers to buy freely and prepare for enlarging their operations in the spring. There is considerable activity in the furniture trade. Lumber also is lively.

A barometer of business is found in the reports on car loadings, which show that the railway traffic in 1922 was larger than ever before. Toward the end of the year this expansion was particularly noticeable, December alone having a record almost equaling the entire year of 1921. Car loadings for the week ending Dec. 30 were 711,200, showing a decrease of 123,391 from the previous week, but an increase of 182,644 over the same week in 1921 and of 108,832 over 1920.

Crop movements to terminal markets continue heavy, and while grain is being widely distributed the available supplies of wheat are increasing faster than before. Summing up the situation, it may be said that the movement of grains to primary markets is the largest in several years.

Confidence Replaces Hope Felt Year Ago

Little Thought Last January That 1922 Would Prove to Be Best in History

NEW YORK, Jan. 15—Confidence that the first half of the year will return a satisfactory volume of business in the sale of automotive products was evident in the manufacturer and dealer enthusiasm displayed at the national automobile show held here last week.

Probably no other show in the history of the industry has been featured by so large and representative a dealer attendance. Reports from practically all parts of the country indicate that current demand for cars and equipment is unusually good for this season, and that a number of orders are booked for spring delivery. Activity in the producing plants must be maintained at a high level based on the information of sustained buying interest gathered from the reports.

—Parts Outlook Good—

Parts makers see a continuance of good conditions for the first half of the year at least, and reflect the general optimism prevailing among car manufacturers and their dealers.

This situation is somewhat different from that of a year ago when the New York show brought forth a hopeful attitude but lacked the confidence that is apparent this year. At the beginning of 1922 there was little thought in the minds of many car makers that during the year there would be produced 2,576,000 cars and trucks, or 370,803 more than were built in 1920, which the industry, at that time, looked upon as the banner year in its production history.

A let-down in buying during 1921, following a year when the volume of business had gone beyond all expectations, gave the manufacturers little hope that operations would be resumed during the new year on a level approaching in any way the high production record of the year before. Nor were there indications that virtually every month in 1922 would establish new records. December

(*Continued on page* 154)

Purchase Plan Stays Standard Parts Sale

Stockholders Agree to Proposal Whereby New Company Would Get Assets

CLEVELAND, Jan. 16—Federal Judge D. C. Westenhaver today gave stockholders of the Standard Parts Co. two weeks in which to perfect their plans to save their $20,000,000 investment in the stock of the corporation, which has been in the hands of a receiver since September, 1920.

Receiver Frank Scott has filed an application to sell the plants, and a hearing was to have been held on this today. But yesterday the stockholders met and voted approval of a plan whereby they are to purchase the plants and operate them.

The various plants of the company are going ahead strong for 1923 and will be operated under much better conditions than have prevailed in the last two years.

$200,000 Already Pledged

Harry J. Crawford, attorney, who represents a group of stockholders, stated that Samuel Mather, capitalist of this city, would subscribe for $100,000 of the stock in a new company that is to be formed by stockholders and that an additional $200,000 had been pledged. It was stated in Federal Court today that some of the largest creditors of the company would talk business with the stockholders when $500,000 is subscribed.

The stockholders' plans provide for the organization of a new corporation having the following capital: $5,000,000 of first mortgage and collateral trust, five year, 7 per cent sinking fund bonds; $3,000,000 7 per cent preferred stock, cumulative as to dividends, and 200,000 shares of no par common stock.

Terms of New Financing

The new company would purchase all the assets of the present company under the direction of court for the amount of the claims of the creditors, which are approximately $8,750,000, unless there is a higher bid. Creditors are to accept as part payment of their claims the $5,000,000 of 7 per cent mortgage bonds at par. The balance of the money necessary to liquidate the remaining items and provide working capital would be obtained as follows: Offer to the present preferred stockholders to subscribe for 40 per cent of their present holdings in the new preferred stock of the new company at par, and to issue to said subscribers two shares of no par stock in the new company for each share of stock in the new companay that is taken; offer to the common stockholders the right to subscribe at 20 per cent of their present holdings in the preferred stock of the new company at par, subject to the rights of the preferred stockholders. Each such subscriber shall receive as a bonus one share of no par stock for each five shares of his present common stock. The book value of the no par stock is placed at $38.50 under such a plan.

Receiver Scott at the stockholders' meeting yesterday explained that shipments of products by Standard Parts in 1922 totaled $7,508,386, on which there was a loss of $74,912. This figure was arrived at after deducting for depreciation, taxes and other carrying charges.

A manufacturing profit of $630,000 was earned before deductions.

One of the first steps to be taken to put the company on a sound earning basis will be the sale of certain non-productive properties, plants which have not been operated under the receivership, but on which the carrying charges have been a heavy burden. The productive plants are the Eaton Axle Co., the Perfection Spring with its service stations, the Standard Welding and the Pontiac Spring, besides which the receiver controls the Bock Bearing Co. of Toledo. With the receivership removed it is estimated these plants should do a $15,000,000 business this year.

RUSHING AUTOMOBILE CARS INTO SERVICE

DECATUR, ILL., Jan. 15—New automobile cars being delivered to the Wabash Railroad by the American Car & Foundry Co., St. Louis, are being rushed into service as fast as the road gets them, according to division reports here. The demand for automobile cars in Michigan and Indiana is unusual for this time of the year, and the new cars are coming in at the rate of 20 a day.

One day a delivery of 70 was made, and they were rushed into the automobile producing centers.

Last week a train of 50 cars was sent through this division point on the Wabash line alone, and the demand indicates that this will soon be a daily average.

Willys States Overland Plans Business Coupe

NEW YORK, Jan. 15—John N. Willys, president of Willys-Overland, Inc., in addressing Overland dealers at a dinner during show week, discussed the price situation frankly and intimated that the company was prepared to meet any price competition that might develop.

Without being specific as to just when the event would take place, Willys told of plans under way for the introduction into the line of a business coupe.

RIO GRANDE BUILDS IN TEXAS

HARLINGEN, TEXAS, Jan. 17—The Rio Grande Tire & Rubber Co. is constructing a plant here for the manufacture of automobile tires.

Studebaker 1922 Net Will Be $18,000,000

Erskine Also Says That Factory Is Prepared for 150,000 Output in 1923

NEW YORK, Jan. 15—The Studebaker Corp. will make $18,000,000 net on its 1922 business, President A. R. Erskine reported at the Studebaker dinner held at the Plaza during show week. Translating the company's business for that year into dollars and cents, the average dealer discount of 22 per cent provided a gross income for the dealers of $33,000,000.

Erskine also stated that the factory is prepared to produce 150,000 cars in 1923. This is an increase of 40,000 over the 1922 production figure, which was said to have passed 110,000.

Erskine announced that the practice of accepting back at full cost price the cars and parts of a dealer discontinuing the line, which has been in actual existence with Studebaker and some others for some time, has been guaranteed by making it a clause of the 1923 Studebacker contract.

While 150,000 cars is the goal for this year, Erskine very emphatically impressed upon dealers the fact that production would progress on a 30-day expectancy program, and that at no time during the year did the factory hope to produce in excess of a month's supply for its sales organization.

Erskine predicted particularly strong markets during the early months of 1923 in the South and the West due to the improvement in the cotton market and constructive work of the farm bureaus.

He was particularly optimistic about the sound prosperity that is indicated for 1923, a prosperity, he said, that gave every indication of being on a much stronger foundation than that of the after war boom.

Reo Storage Building Will House 3000 Cars

LANSING, MICH., Jan. 15—The storage and shipping building which the Reo Motor Car Co. will put up will cost about 500,000 and have approximately 640,000 sq. ft. of floor space. The dimensions are 577 ft. by 365 ft. and will include a train shed, which will accommodate seventy-two freight cars at a time. Railroads serving the property are the Michigan Central and Grand Trunk.

The building also will include the export shipping department, where cars will be crated and prepared for shipment. Space for the storage of 3000 cars will be afforded. The storage stock will be drawn upon in making shipments and kept replenished by the manufacture of new cars. Storage has been largely outside of the plant. Under the plan, cars will be under cover at all times.

Goodyear Financing Is Under New Fire

Dissenting Directors Ask That Sum Paid to Leonard Kennedy Be Returned

AKRON, Jan. 16—On behalf of stockholders of the company, Francis Seiberling and Russell Robinson of Akron, directors of the Goodyear Tire & Rubber Co., have filed suit against Goodyear, the Leonard Kennedy Co. of New York and all stockholders in the Kennedy company, for the return to Goodyear of the sum of $493,082, alleged by them to have been paid the Kennedy company as "compensation for furnishing Goodyear with a president and treasurer."

This newest suit involving the Goodyear $85,000,000 refinancing, the legality of which already has been attacked in four separate actions filed on behalf of Goodyear stockholders by Mrs. Laura T. Weiss of Cleveland, following the filing here in the Weiss suits of depositions of E. G. Wilmer, Goodyear president, and Clarence Dillon, head of the New York financial house of Dillon, Read & Co.

Nassau Holds Big Interest

Dillon's deposition contains his statements that the Nassau company of New York holds a controlling interest of 22,500 shares of stock in the Leonard Kennedy Co., and that his wife controls the Nassau company. He also says that Wilmer is a stockholder in the Kennedy company, owning 5000 shares; that A. S. Schlesinger of Milwaukee, a Goodyear director under the refinancing, owns 16,750; that A. H. Springford, former assistant to Wilmer at Goodyear, holds 500 shares, and that 5000 shares are held by Leonard Kennedy, former employee of Dillon, Read & Co.

Dillon in his depositions further states that the $27,500,000 issue of Goodyear gold debenture bonds, issued under the refinancing program, was sold to a banking syndicate headed by himself for 90 cents on the dollar; that he personally re-purchased the entire issue from the bankers at 92½ cents and then re-sold the debentures to the public at 99 cents. Dillon also says that of 275,000 shares of Goodyear common stock given to the bankers with the understanding that they go to the public—ten shares with every $1,000 debenture—as a bonus for buying the debentures, he secured a three-year option on 170,000 shares at $1 a share. This stock now is selling at $10 and $11 a share.

Hold Shares as Trustees

Dillon also states that he, Owen Young of New York and John Sherwin of Cleveland, as trustees of 10,000 shares of management stock issued under the Goodyear reorganization, hold a voting power which will elect a majority of the Goodyear board of directors, the 10 000 shares having more voting power than all other Goodyear stock combined.

Dillon's deposition gives the authorized capitalization of Goodyear at 2,910,000 shares, divided into 400,000 shares of prior preference stock of $100 par value each; 10,000 shares of management stock of $1 par value each; 1,000,000 shares of preferred stock of $100 par value, and 1,500,000 shares of common stock of no par value.

HOW CAN INDUSTRY ENLIGHTEN FARMERS?

TOLEDO, Jan. 14—What is thought to be the typical attitude of the Ohio farmer on matters involving taxation and road construction is found in resolutions passed by the Board of Directors of Lucas County Farm Bureau here at a recent meeting.

The farmers will recommend to the new State Legislature that assessments for road building levied against abutting property be limited "to a fixed percentage based on a road that is suited to the farmers' needs and not for the type of road built for freight trucks or pleasure boulevards."

They also went on record as favoring a gasoline tax for funds to repair and maintain roads.

Dismissal of Receiver Sought by Burdick Tire

NOBLESVILLE, IND., Jan. 15—The Burdick Tire & Rubber Co. has filed a suit here asking that the receiver be dismissed. In its motion it disputes claims set out in suits brought by Roy E. Rice and Henry Dech, former officers, although a receiver had been appointed on the strength of the claims.

Company officials said that only about $11,000 worth of raw materials had been sold and that they were disposed of at the market price. Dissipation of the company funds was denied.

The motion further sets out that the total obligations of the concern do not exceed $150,000, that $136,000 mortgage bonds of the total of $250,000 still remain unsold and that the company is not in danger of becoming insolvent.

Perfection Tire Plant Reopening to Be Asked

FORT MADISON, Jan. 15—P. S. Junkin, ancillary receiver of the Perfection Tire & Rubber Co., will submit a report of the financial status of the company with invoices, statements of assets and other data, to Judge Martin J. Wade in Federal Court next week.

Favorable action upon the report may open the way to the resumption of operations at the plant and it is understood that the report will show a greatly strengthened financial condition. Attorneys will argue that the report is sufficient for the court order to permit reopening of the plant.

Syracuse Creditors Form Syracord Tire

Stockholders of Old Company Will Be Taken in Under Reorganization Plan

SYRACUSE, Jan. 16—Formation of the Syracord Tire & Rubber Co., Inc., to bid in the assets of the Syracuse Rubber Co. has been completed by the creditors. Federal Judge Frank C. Cooper has ordered a sale of the property Feb. 15, and at that time the new company will acquire the assets at a nominal cost and continue the operation of the plant here. William F. Rafferty, receiver, has filed notice of the proposed sale.

The reorganization plan proposes to take in all the stockholders of the Syracuse Rubber. These will be asked to put in new money to finance the corporation, the amount to be determined in proportion to the present holdings. The large creditors of the company have given assurances that they will cooperate in the reorganization. The details of the plan are being worked out and will be announced within a short time.

Directors of the new corporation include: David S. Blanden, Edward C. Kauffman and D. W. Hempstead, all of Syracuse. The basis of the new company is 100 shares of stock of no stated par value.

Liabilities of the Syracuse Rubber Co., which the new concern proposes to take over, are $150,000 in bonds and $230,000 in other indebtedness.

New National Can Corp. Elects McMillan as Head

DETROIT, Jan. 15—The National Can Corp. has been organized to take over the business of National Can Co. The new organization is incorporated for $1,150,000 fully paid in and is ready to launch plans for the increase of its manufacturing facilities here. The radiator department will be doubled in capacity through the installation of new equipment and, for the present, the company will concentrate its automotive business on this product.

Under the reorganization, Neil McMillan has been made president and treasurer. He was secretary and general manager of the former company from its organization in 1901. A. V. Crary is vice-president and general manager, returning to the company from the American Motor Body Co., with which he served as general sales manager for two years. He had been with the National Can for nineteen years previously, serving last as district sales manager in Chicago. Neil McMillan, Jr., is secretary and A. G. Canby, sales manager. The new secretary has been in charge of the radiator department for the last ten years. Canby has been with the company since 1901.

Ford Show Becomes Center for Exports

New York Exhibit Made Permanent with 72 Manufacturers Taking Space

NEW YORK, Jan. 15.—Ford's export center will be located in this city. A decision has been reached that the power and transportation show held here last week as an exhibit of industrial, agricultural and commercial machinery adapted for use with Ford trucks and Fordson tractors, will be continued as a permanent export market with headquarters and showrooms in the Ford building. Seventy-two manufacturers with products ranging from lubricating oils to steel machinery designed for excavating, concrete mixing and heavy duty transportation have taken space for display.

The establishment of this export center will bring direct representation of the leading manufacturers of farm machinery and power appliances into one centralized exposition for the convenience of foreign buyers coming to New York City from all countries.

In establishing this center, Gaston Plantiff, Ford's eastern representative, says:

This is the consummation of a plan which has been in the process of development for the past year. The present chaotic conditions in the European countries cannot last much longer. Some semblance of order in internal conditions is already visible and this soon will crystallize into a renewed demand for American made products. The South American trade is growing better steadily and the time never was more ripe than it is at present for the turning of this condition to the advantage of manufacturers in this country.

Ford Schedules 108,000 Cars and Trucks This Month

DETROIT, Jan. 15—Schedules in the Highland Park and River Rouge plants of the Ford Motor Co. this month call for 108,000 cars and trucks and 400 tractors daily, the highest figure the company ever has fixed for January. Mid-winter business throughout the country has mounted to unprecedented figures, the company declares. Plants at Manchester, Buenos Aires, Cadiz, Bordeaux, Sao Paulo and Copenhagen report a January demand much larger than last year and unusually high for this time of year.

Shipments of Fordson tractors are being made into Russia by the Mennonite settlement at Hillsboro, Kan., through the Mennonite Relief Committee of the American Relief Administration, for the use of Mennonites in the southern part of that country. A Ford representative and a tractor expert in Constantinople are going to Moscow to offer all necessary instruction in the use and maintenance of the tractors. The Soviet government furnishes the fuel for the tractors and the seed for planting.

Resumption at Portland

PORTLAND, ORE., Jan. 17—Before the end of this month assembly of Ford automobiles, discontinued during the war, will be resumed in Portland at the rate of 50 cars per day, according to W. H. Goodwin, manager of the local branch of the company. Equipment for assembly is already being installed.

Under the new arrangement the plant here will produce more cars than it ever did under the former assembly arrangement. The greatest output reached before the war was thirty-five.

ABBOTT L. JOHNSON DIES

MUNCIE, IND., Jan. 15—Abbott L. Johnson, president of the Warner Gear Co. and the Blascock Body Co., died Jan. 11 at his winter home in Daytona, Fla., after an extended illness, superinduced by a severe attack of pneumonia last April. He was associated with the Warner Gear Co. since its inception in 1902 and was elected president in 1908.

PACKARD DROPS BRANCH

DETROIT, Jan. 16—Closely following the disposal of its St. Louis branch to the Berry Motor Car Co., the Packard Motor Car Co. has sold its Kansas City branch to the newly organized Reidstith Motor Co. The Packard company will continue its remaining four branches at New York, Chicago, Philadelphia and Detroit.

DURANT OUTPUT GAINS

DETROIT, Jan. 15—Durant Motor Co. of Michigan is entering upon a schedule of 260 Star cars and 60 Durant fours daily, an increase over recent output of about 25 per cent. The company has been somewhat retarded by delays in body deliveries, but these are now coming through in increased quantity.

RUMORED FORD WANTS HAMPTON ROADS BASE

NEW YORK, Jan. 15—Henry Ford has another ambition. According to the latest rumor, he wants to buy the army base overlooking Hampton Roads, which was built during the war at a cost to the Government of $200,000,000, and which now, it is said, can be bought for $17,000,000. Ford is said to be planning to use Norfolk as an export point for his South American trade. Hampton Roads is regarded as ideal for water terminals for steamships, the base having mammoth steel and concrete piers.

Officials of the Ford Motor Co. refuse to comment on the rumor, while the War Department at Washington says it is without information on the reported offer.

Time Payment Plan Adopted by Citroen

First French Producer to Take It Up—8 Per Cent Interest Is Charged

PARIS, Jan. 6 (*by mail*)—With the new year Citroen inaugurated for the first time in France a system of automobile sales on the deferred payment plan. The conditions are 8 per cent interest per annum on the outstanding payments.

Thus, for his normal four-passenger car, the cash price of which is 13,900 francs, with 10 per cent State luxury tax included, a deposit of 1,000 francs has to be made on placing the order, 2,475 francs on delivery, and 906 frs. 40 c. in 12 monthly instalments, making a total of 14351 frs. 80 c. The same general conditions are offered for all other models, the small 5-hp. two-seater being procurable on twelve monthly payments of 606 frs. 45 c.

While coming as a surprise, this move on the part of Citroen has met with the approval of the trade in general and even of manufacturers, except those in direct competition.

Sales on the deferred payment system are common with some of the leading department stores, but have never been taken up by automobile manufacturers. A few dealers have sold under these conditions, but their transactions have been on a very limited scale and in many cases have been devised to avoid payment of the unpopular 10 per cent State luxury tax.

French credit generally being very sound, the Citroen move appears likely to be a complete success and undoubtedly will tend to broaden the automobile market by effecting sales among persons of substantial financial standing too much obsessed by the French spirit of economy to make a purchase outright.

United Consumers Corp. Placed in Receivership

MILWAUKEE, Jan. 15—Following the granting of a judgment for $12,820 in favor of the Ajax Rubber Co., the United Consumers Corp. of Milwaukee, with about 4000 stockholders and a chain of automotive equipment stores and filling stations throughout Wisconsin, has been placed in the hands of a receiver. It is one of the largest cooperative enterprises in the Wisconsin trade.

Herbert J. Peterson of Sturgeon Bay, banker and president of the corporation, was appointed receiver, but, on objections of stockholders, he was removed and Julius J. Goetz, substituted.

The concern was organized in 1920 by Homer E. Ross, now living in California, and built up a chain of 57 filling stations and 42 storage stations. Liabilities are variously stated to be $180,000 to $300,000, and assets of about $600,000 are claimed.

Will Apply Used Car Plan in Truck Sales

N. A. C. C. to Attempt to Nationalize Boston Method—Caution Plate Revised

NEW YORK, Jan. 15.—After a day spent in listening to addresses and discussion, a special conference of truck manufacturing members of the National Automobile Chamber of Commerce announced its interest in the Boston used car plan and decided to attempt to nationalize it and apply it to motor trucks with such modifications as may be necessary to permit of its use in this field. More than 100 representatives of the truck branch of the industry attended the conference.

The conference also adopted the revised caution plate for trucks upon which a committee has been working for some time. It likewise approved the definition of common carrier principles as outlined by the Motor Vehicle Conference Committee, with which are affiliated the American Automobile Association, the Motor and Accessory Manufacturers Association, the National Automobile Chamber of Commerce, the National Automobile Dealers Association and the Rubber Association of America.

Sanders Outlines Plans

L. B. Sanders, secretary of the Boston Used Car Statistical Bureau, outlined the Boston plan as one in which eighty passenger car dealers cooperate through a central bureau to exchange information on allowances, reconditioning and resale prices of used cars. On this allowance, reconditioning and resale price information are based maximum allowance figures for all makes and models of cars.

Sanders said that he believed the Boston plan could be adopted only in principle to the truck industry. The difference between one car and another of the same make and model is not likely to be so great that a maximum allowance price could not be applied, but the service in which trucks are used creates an entirely different situation. It is apparent that if two identical new trucks are started in service on the same day, one in overland hauling on good highways and another carrying heavy loads out of excavations, their value at the end of a year would be widely divergent and the maximum allowance would not apply.

Believes Allowance Bases Possible

Sanders suggested that it might be possible to work out allowance figures by classifying trucks as to uses along with age. If such a plan proved too complicated, he still believed that truck merchants could cut down used truck allowances by getting together in their communities and establishing a basis of trade values on used trucks figured on their actual condition. He believed that this could be handled through a local appraisal committee if it was found undesirable, on account of expenses or detailed work, to establish a weekly used truck sales report such as is applied to cars under the Boston plan.

"Fundamental Principles" Defined

When motor vehicles are used as common carriers they should be subjected to regulations, is the belief of the Motor Vehicle Conference Committee, whose "fundamental principles to underlie State legislation providing for the regulation of motor vehicles used as common carriers" were adopted by the truck conference. This committee also believes that the governing bodies of local incorporated municipalities should not have any power in the premises. As revised and approved by the truck conference this new common carrier creed is as follows:

1—Control over intrastate transportation of persons and property for hire over regular routes or between fixed points, if adopted, should be exclusively in the hands of some agency of the State. No power whatever in the premises should be vested in the governing bodies of the municipalities of the State.

2—Such State control over motor vehicle common carriers should be placed in existing commissions, such as the public utility commissions, etc., of the various States. It should be provided, however, that at least one member of such commission should be conversant with and in sympathy with motor transportation.

Prerequisite to Operation

3—As a prerequisite to the operation of a motor vehicle common carrier, the owner thereof should be obliged to obtain:

a. A certificate of public convenience and necessity with a proviso that lines in actual operation before the law goes into effect shall prima facie be regarded as necessary to public convenience and necessity and should, therefore, automatically be granted a certificate.

b. Carry insurance sufficient to indemnify persons damaged by negligent operation of a carrier.

4—The State regulatory bodies having control over motor-vehicle common carriers should be vested with the same powers they exercise in controlling other forms of public utilities.

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TRUCKS MEET BOATS IN NORTH CAROLINA

KINGSTON, N. C., Jan. 15—This city is trying out a new experiment in transportation. A truck line has been established by the Chamber of Commerce to connect with boat line terminals at New Bern. It is believed that cheaper freightage may be secured in this way and the plan will be given a thorough tryout. Hard surface road connects the two cities.

Chamber of Commerce men say that in a few months trucks will handle a large volume of freight in this section, due to the good roads and the high rail rates. Modern roads in this section are being used by several passenger bus lines already.

Orders Satisfactory with Truck Builders

Prospects for Spring Demand Favorable—County Governments Getting Busy

MILWAUKEE, Jan. 15—All of the automotive industries here are again operating at full capacity schedules, following the holiday and inventory interruptions, which in many cases were of lesser extent than in others, owing to the pressure of delivery instructions. Passenger car factories as a rule are back on heavy production schedules, both to cover unfilled orders and to make up stock for shipments later. The early part of the show period has served merely to confirm high hopes of a big spring business.

Motor truck manufacturers here are working steadily, and current orders are described as wholly satisfactory, with prospects for spring demand considered very favorable. This applies both to freight trucks and passenger-carrying equipment. At this time many county boards in Wisconsin and other States are beginning to take steps for the investment of appropriations made at the annual sessions held in November and December for the purchase of trucks, tractors and other road construction and maintenance equipment. Considerable of this machinery, however, will not be bought until the Good Roads Congress at Chicago later this month.

New Plant Delivers Nash Cars

Nash this week is getting the first concrete results in the shape of finished cars from the addition completed Jan. 1, which has enlarged its four-cylinder car division in Milwaukee 100 per cent. The first LaFayette cars to come through the new Milwaukee factory, which has replaced and supplanted the original works in Indianapolis, are due during the coming ten days.

Tire factories had little interruption of production, due to the necessities of the situation, which requires a large output both to replace jobbers' and dealers' stocks at once, and to prepare for the heavy spring demand. Spring orders already on books are the heaviest on record.

Retail Conditions

Sales in the Milwaukee buying district during the first two weeks of the new year are reported to be of very satisfactory volume. Contrary to general belief, demand is not limited to closed types but covers the entire field. It is true that closed cars are perhaps in the best request, but they likewise are scarce and in many instances buyers are taking sport models and even the ordinary open types in order to get prompt delivery.

This January looks far better than the first month in 1922, which is especially encouraging.

C. H. Wills Properties Valued at $5,161,942

Appraisal Places Current Assets at $73,992—No Sale of Plant Before March 1

DETROIT, Jan. 17—Appraisal of the C. H. Wills & Co.'s properties at Marysville and other points as filed in the United States District Court here places a total valuation of $5,161,942 on all assets taken on the basis of the company as a going concern. The appraisal is divided into four classes, the largest of which is fixed assets, $3,427,150; and the smallest, current assets, $73,992. Cash is $6,403.

One of the largest items in the merchandise inventory assets is finished cars at outside points which are valued at $461,006. These, the appraisal notes, have been inventoried at cost. Finished cars at the factory are inventoried at either physical or reproduction value. The net sound value of the merchandise inventory is shown as $1,593,991 as against the physical value of $2,236,360. On fixed assets a total of $796,197 is deducted for depreciation. This ranges from 5 per cent on buildings to 50 per cent on patterns, tools, jigs, etc., and almost 100 per cent on office fixtures, etc.

The current assets include cash, $6,403; accounts receivable, $11,105; notes receivable, $56,448; and deposits, $35.

The merchandise inventory assets embrace car materials and supplies, $1,130,000; finished cars at outside points, $461,006; and miscellaneous inventory, $2,986.

Fixed Assets of Company

The fixed assets are land, $200,280; buildings, $850,388; building and factory equipment, $552,391; machinery, $1,019,314; patterns, $47,564; tools, dies, jigs and fixtures, $483,368; factory cars and trucks, $6,200; office furniture and fixtures, $29,070; and perishable tools, $238,573.

Deferred assets are unearned insurance premiums, $27,058; and prepaid interest on loans, $59,751.

The report is signed by J. G. Heaslet, C. A. Pfeffer and R. H. Gordon, appraisers.

A financial statement on the company will be issued by the Security Trust Co., receiver, next week. The date of sale will depend largely upon the creditors' action, the receiver states. There is little possibility of this taking place before March 1. No overtures have been made to the receiver indicating prospective purchasers.

BIGGAM IS REORGANIZING

RACINE, WIS., Jan. 15—The Biggam Trailer Co., originally established in Milwaukee, but for the past year operating a plant in Racine, is undergoing a reorganization. To conserve the assets, the Racine court has granted a petition for a receivership, and L. E. Pitner, secretary of the corporation, has been placed in charge of affairs. Unless reorganization can be effected locally, it is intended to move elsewhere. The capital stock is $265,000. The company both leases its patent rights on trailers to motor truck manufacturers and builds trailers for the commercial market.

Profits of Continental in 1922 Were $1,560,944

DETROIT, Jan. 17—Continental Motors Corp. had a most profitable year, according to the report made by President R. W. Judson at the annual meeting of the stockholders today. The surplus account showed a balance of $4,779,065 on Nov. 1, 1921, to which was added net profits for the year ending Oct. 31, 1922, of $1,560,944, less provision for Federal income and profit taxes of $91,000. Dividends of preferred stock at 7 per cent amounted to $145,048, leaving the net surplus at the end of the fiscal year $6,106,926.

Preferred shares to the amount of $259,800 were acquired during the year for retirement. On Jan. 1, 1923, there were 6200 stockholders, despite the retirement of the preferred stock. Previous to Jan. 1 the corporation paid off all the bank indebtedness shown on the balance sheets as $1,450,000.

Value of sales orders on the books Oct. 31 totaled $54,000,000, of 39 per cent more than at the close of the previous year, notwithstanding the fact that prices of engines were materially reduced during the year. Sales of large truck engines increased two and one-half times the sales of the previous fiscal year, Judson reported. Sixty main service stations are being maintained, and plans call for this total being increased to 300 eventually.

Cab Interests Planning to Build Knight Engines

MOLINE, ILL., Jan. 17—H. A. Holder, president of the R & V Motor Co. of this city, announces a deal whereby the Chicago Motor Bus Co. and the Yellow Cab Manufacturing Co. of Chicago will take over certain machinery and equipment which are used in the production of R & V Knight engines, and which will be operated by the Chicago concerns.

The bus company has been using Knight engines and plans to increase production under the direction of its own officials. Possibly the R & V Knight engines will be used in the Yellow taxicabs. Holder declares the deal has no connection with the R & V passenger car, which will continue to be manufactured by the R & V Motor Co.

AUTO-LITE PLANT ACTIVE

FOSTORIA, OHIO, Jan. 15—The local plant of the Electric Auto-Lite Co. has swung into full production with 450 employees and the expectation of increasing this number to 600 within two months.

Rubber Conference Will Start at Once

Representatives of London Growers' Association Due to Arrive This Week

NEW YORK, Jan. 16—Plans for the meeting of committees representing the Rubber Association of America and the Rubber Growers' Association of London, which will discuss the British crude rubber restriction act and its effect upon the American industry, are being made. The English committee of three is due to reach New York this week, and the joint session will start at once, for the visitors are due to sail for home on Feb. 10. The sessions will be held in New York, but a trip to Akron is scheduled during the visitors' stay in this country.

The British restriction act will be discussed from all angles. Its importance to the American rubber industry is shown by the request of Secretary Hoover of the Department of Commerce that he be kept advised as to the discussions and action of the committees.

In preparation for the meeting the Rubber Association of America has compiled statistics from a special questionnaire which was sent out by the association on Dec. 1, and which was answered by 341 American and sixteen Canadian manufacturers, representing 95 per cent of the industry.

The questionnaire was taken on the consumption of crude and reclaimed rubber in this country for the last four years and disclosed the fact that 1922 was a record year in that the total quantity of crude rubber consumed for all purposes in that period was 283,271 long tons, in both the United States and Canada. Of this between 75 and 80 per cent went to the tire manufacturers. In 1921 the total was 169,308; 1920, 196,270, and 1919, 202,303.

An inventory of the crude rubber in the United States and afloat for United States ports on Oct. 31, 1922, shows 84,982 long tons on hand and 43,514 afloat. In this inventory are included 341 American manufacturers, sixteen Canadian and thirty-eight American importers and dealers.

HERCULES TO CONTINUE

CLEVELAND, Jan. 15—Charles Balough, vice-president and general manager of the Hercules Motor Manufacturing Co. of this city, maker of engines, has been appointed receiver for the Hercules company, with orders from the court to continue the operation of the business without interruption.

HEWITT PRICES INCREASED

BUFFALO, Jan. 16—Hewitt Rubber Co. announces an increase in price of 12½ per cent on cords, 10 per cent on fabrics; 5 per cent on Ford sizes of cord tubes and 15 per cent on all other grade tubes and all sizes of red tubes.

Men of the Industry and What They Are Doing

McNaughton Cadillac Vice-President

H. H. Rice, president of the Cadillac Motor Car Co., announces the election of Lynn McNaughton, general sales manager, as a vice-president of the company.

H. H. Franklin Arrives Home

Hurrying home from Europe, H. H. Franklin, president of the H. H. Franklin Manufacturing Co., reached New York just in time to be in at the close of the automobile show in New York. Franklin reports that while the outlook is not as bright abroad as it is in this country, still marked improvement has been made within the last year, and he looks for a steadily increasing market for American cars.

Nash Elected Bank Director

Charles W. Nash of Kenosha, Wis., president of Nash Motors Co. and the LaFayette Motors Corp., Milwaukee, was elected a director of the First Wisconsin National Bank of Milwaukee at the annual meeting of stockholders. This is the largest bank in the Northwest, with capital and surplus of $10,000,000, and controls the First Wisconsin Trust Co. and the First Wisconsin Co., a big security house.

Post Succeeds Bailey

Harry L. Post, assistant sales manager of the Seiberling Rubber Co., has been elected vice-president and sales manager, succeeding Irving R. Bailey, whose death occurred Jan. 9, following a stroke of apoplexy suffered on New Year's day. Post also becomes a director of the Seiberling company. Post virtually grew up in the rubber industry under Bailey, serving as his assistant when Bailey was with the old Diamond Rubber Co. prior to its merger with the B. F. Goodrich Co. In 1913 both joined the Goodyear Tire & Rubber Co., Bailey in charge of mechanical goods sales and Post in charge of sole and heel sales. Bailey later became assistant sales manager of the company. They resigned from Goodyear in the fall of 1921 to join the new Seiberling company. Post is 38 years old, and a graduate of Wooster College, Wooster, Ohio.

Jacobsson to Handle National Abroad

Birger Jacobsson, well known in export circles, has been appointed European traveling representative for National Motors Corp. He will handle the National passenger car line and Traffic trucks. Jacobsson expects to sail for Europe about the end of January.

Giddings & Lewis Names Wenzell

E. V. Wenzell, until now associated with the Cincinnati Grinder Co., has joined the Giddings & Lewis Manufacturing Co., Fond du Lac, Wis., manufacturer of lathes, tools and other metal-working equipment, in the capacity of director of sales. He has been connected with the machine tool industry nearly 20 years, starting his career with the Norton Co., Worcester, Mass., then going to the Modern Tool Co., Philadelphia.

DeDiemar Joins Carbon Remover

Benjamin F. DeDiemar, who retired Jan. 1 as clerk of the circuit court of Kenosha, Wis., has become vice-president of the Perfect Carbon Remover Co., Milwaukee, in complete charge of the sales department. The concern makes a liquid carbon remover and was established seven years ago.

Craig Goes to Atlanta

Hugh M. Craig, formerly general sales manager of the Samson Tractor Co. at Janesville, Ill., and previously assistant to the general manager of the Janesville Machine Co., manufacturer of farm implements, has been appointed manager of the Olds Motors Works' branch recently established at Atlanta.

George Fritz Resigns

George Fritz has announced his resignation as general manager of the Association of Automotive Equipment Manufacturers, Chicago. He has not stated his plans for the future. Fritz was formerly field secretary of the Automotive Equipment Association and later became general manager of the Research Bureau of Chicago. From that position he became general manager of the Association from which he has just resigned.

Star Rubber Takes on Gorman

Fred W. Gorman has been added to the sales personnel of the Star Rubber Co. as southern district manager, with headquarters at Atlanta. Gorman was previously identified with Brunswick and Dayton.

Ohio Rubber Promotes Vollmer

L. F. Vollmer, formerly in charge of the automotive equipment division of the Ohio Rubber Co. at Cincinnati, has been made general manager of the Cincinnati office, with Walter Qualey as his assistant.

Laminated Shim Names Cosley

Stacey H. Cosley, who has been associated with the automotive industry for 22 years, has been appointed central western representative for the Laminated Shim Co. of Long Island City, N. Y.

Pollard to Visit Europe

E. E. Pollard, secretary and treasurer of the Traveler Rubber Co., Bethlehem, Pa., will sail for England and Continental Europe this month in connection with the company's export business.

Franks Joins Wayne Tank

C. E. Franks, who has been head of the export department of S. F. Bowser & Co., pump and tank manufacturers of Fort Wayne, Ind., has been named manager of the export department of the Wayne Tank & Pump Co., also at Fort Wayne. The export department of the Wayne company will be enlarged considerably to take care of its greatly increased business.

Crittenden Lovejoy Sales Head

George Crittenden, one of the pioneers in the industry, his association dating back to the early days of motoring when he was Premier dealer in Boston, has become retail sales manager of the Lovejoy Manufacturing Co., whose headquarters are in Boston. Until a few years ago he was a partner in the Chandler New England Co.

Additions to Agencies

Lynn B. Dudley, formerly advertising manager of the Federal Motor Truck Co., has joined Campbell, Trump & Co., advertising agency, Detroit.

Cliff Knoble, until recently advertising manager of the Liberty Motor Car Co. has made a connection with Brooke, Smith & French, advertising agency, Detroit. Norman I. Taylor has been added to the same agency. He formerly was sales manager for the William N. Albee Co.

Witness Says Standard Oil Decides on Prices

WASHINGTON, Jan. 17—The Senate's investigation of gasoline prices, which has been under way for six months before the Senate Manufacturing Committee, has again taken up the charge that the so-called Standard Oil groups are responsiule for the present retail price of gasoline.

Hundreds of witnesses have been heard, but to date the committee has made little progress in solving the gasoline cost. One of the last witnesses heard was L. V. Nicholas, president of the National Petroleum Marketers Association, whose organization represents 850 independent oil producers. He declared in his testimony that "gasoline and oil prices are what the Standard Oil makes them."

HOIST COMPANY LIQUIDATING

MILWAUKEE, Jan. 16—The Perfection Hoist & Engine Co. of Two Rivers, Wis., originally organized in Milwaukee two years ago to manufacture mechanical motor truck hoists, contractors' equipment, etc., is liquidating its assets.

All of the tools, machinery, equipment and stock have been turned over to creditors, who are making disposition.

Hupp Offers Dealers Storage Facilities

Cost for Accommodation Small—Surplus of 4000 Cars Built to Meet Demand

NEW YORK, Jan. 13—Preparing for the greatest year in its history, Hupp Motor Car Co. has built up a surplus of approximately 4000 cars, which it expects will be required for the business of its dealers in the first few months of the year. This, said President Charles D. Hastings at the company's New York dealer meeting, exemplifies Hupp's confidence in the developing demand for cars.

The new factory buildings of the company will be ready for production in the next 30 or 40 days, Hastings said. The company has taken over the entire body output of the Racine company, which formerly supplied both Hupp and Mitchell, assuring it of 150 bodies every day. This will be necessary for the anticipated production of 40,000 cars in 1923, 35 per cent of which will be closed models.

O. C. Hutchinson, sales manager, advised dealers to get shipments of cars through to their districts at once in order to be prepared to make immediate deliveries when spring buying begins. There was a strong possibility of a continuance of difficulty in getting adequate facilities for requirements later on, he said.

Dealers without storage facilities in their respective districts could arrange with the company to store cars in Detroit at a low cost per car, Hutchinson said, but this would insure them only of cars and not their transportation. Arrangements could be made through the company for the financing of purchases now if dealers desired to store cars, he said, and to protect dealers buying cars in this way, he added, the company would guarantee no price action until May 31.

New Company to Exhibit "Tarkington" at Chicago

ROCKFORD, ILL., Jan. 16—At the head of the Tarkington Motor Car Co., which will announce the new "Tarkington" car in the $2,500 class in Chicago during show week, is P. A. Peterson, president of the Mechanics Machine Co. and the Rockford Drop-Forge Co. of this city. Peterson also is heavily interested in a number of other local concerns. The secretary of the company is C. E. Swenson, vice-president of the Rockford Drilling Machine Co. and a stockholder in other companies.

The treasurer is Levin Faust, treasurer of the Mechanics Machine Co. and secretary and treasurer of the Rockford Drop-Forge Co. He also is vice-president of the Rockford Tool Co. The factory manager is J. A. Tarkington, who has been connected in the past with the Apperson and Kissel companies. C. B. Williamson is general sales manager.

The company will manufacture one chassis with a full line of open and closed bodies. Many of the units will be manufactured by the various metal working plants owned and managed by the officers of the company. These concerns have long been engaged in the manufacture of automobile parts which have been widely marketed. Some units will be purchased. A new plant will be utilized for assembly.

Dodge Manufacturing Is Now Own Sales Agent

MISHAWAKA, IND., Jan. 15—The Dodge Sales & Engineering Co., which for the past eight years has been operating as the selling subsidiary of the Dodge Manufacturing Co. and Dodge Steel Pulley Corp., has been consolidated with the parent company, the Dodge Manufacturing Corp., which was organized and began business last July.

The distribution of Dodge products, which heretofore has been done under the name of the Dodge Sales & Engineering Co., will hereafter be conducted by the sales department of the Dodge Manufacturing Corp., with Duncan J. Campbell, general sales manager in charge, and John A. Beynon, as assistant general sales manager. The district sales organization of the Dodge Sales & Engineering Co. will be continued as branches of the sales department of the Dodge Manufacturing Corp.

The Dodge Manufacturing Corp. manufactures power transmitting appliances. It also controls the Dodge Manufacturing Co. of Canada, Ltd., with head offices and works at Toronto and sales office at Montreal.

Chevrolet Reestablishes Pacific Northwest Zone

PORTLAND, ORE., Jan. 17.—The Chevrolet Motor Co. has opened a new zone, known as Zone No. 19, to handle the territory of Oregon, Washington, Idaho and western Montana. W. J. Richmond, formerly territorial representative for the Chevrolet in this district, and more lately assistant to F. N. Coats, general Western sales manager, has been named zone manager.

The Chevrolet Building, erected especially for the company two years ago last fall, will be headquarters. Shortly after the structure was completed it was occupied for that purpose, but a change in policy resulted in giving up the Pacific Northwest zone and making Oakland general Western headquarters. The new plan reestablishes the Northwest zone, with headquarters here, although general quarters for the coast will continue at Oakland.

PRICE OF NEW JEWETT MODEL

NEW YORK, Jan. 16—Price on the new Jewett special phaeton has been fixed at $1,150 f.o.b. Detroit. The new model gives Paige-Jewett dealers a complete line of open models with prices ranging from $995 to $2,695.

Greatest Era Seen at Roads Congress

Show and Convention Draw 30,000 Delegates and Visitors to Chicago

CHICAGO, Jan. 16—Intense nationwide interest in the construction and maintenance of hard roads and motor vehicle transportation over them is manifested in the attendance of 30,000 delegates and visitors from all sections of the country at the thirteenth good roads congress and the twelfth annual convention of the American Road Builders' Association here this week. The fourteenth national good roads show, exhibiting all the most modern road building machinery and equipment, is being held in conjunction with the congress and convention.

Concerning the convention and show, the association's president, Thomas J. Wasser, State highway engineer of New Jersey, says:

"This show and congress precedes what promises to be the greatest era of road building in American history."

The program opened today with an address by Wasser. Thomas H. MacDonald, chief of the United States Bureau of Public Roads, is scheduled for an address on "Continued Highway Expenditures Required to Meet Traffic Demands of the Future." Highway commissioners and engineers of many States are also on the program.

There is a strong sentiment among the delegates to try to improve the conditions under which roads are built and maintained in order to get politics out of the highway programs. Standardization of construction, maintenance and traffic regulation will be discussed.

There are about 200 exhibitors at the show.

Paige Has Department to Check Up on Sales

NEW YORK, Jan. 12—Paige-Detroit Motor Car Co. and Jewett Motors will distribute their product this year through a distribution department which will keep constant check on sales conditions and actual business in every district in the country. The system is planned to be the most scientific and systematic method of handling automobile business that has been devised, President H. M. Jewett told dealers at the annual Paige dinner show week.

Through the distribution department the company will keep informed on makes and quantities of cars being sold in each territory. It will be used to check up dealer activity as well as for equitable apportionment of product to the sales organization. The factory has gaited itself for production on a basis of a live, hustling sales organization, Jewett said, and it will be kept alive by the continuous study of activities of each of its members.

M.A.M.A. Shows Gain in Members in 1922

Increase Is Twenty-four, Total Membership Being 430—Work of Organization

NEW YORK, Jan. 15—The report of E. H. Broadwell, retiring president of the Motor and Accessory Manufacturers Association, tells of the rapid growth of the organization and the work it is doing. The M. A. M. A. finished the year with 430 members, an increase of twenty-four over 1921. During the year forty-five companies went out and sixty-nine took their places. The association started nineteen years ago with thirty-nine members.

Broadwell gave particular credit to the credit department which showed a record for cooperation of 87 per cent, which is claimed to be exceptionally good. The department handled 231,036 inquiry blanks, and the names of 3432 jobbers, parts makers and car builders were cleared. It also made 8755 special reports. The department has five groups of non-competitive members for personal exchange of credit experience and information.

The traffic department during the year secured reductions on wheel hubs, visors, speedometers, passenger bodies, batteries, jacks in bags, automobile parts and body and top irons. In addition, through its efforts, the transcontinental lines granted reduction in freight rates on all kinds of wheels when shipped in carload lots from manufacturing points east of the Mississippi to the Pacific Coast. The department collected more than $5,000 overcharges for members. There were sixty-seven companies which submitted their freight rates for audit, amounting to $900,000.

The educational department saved several thousands of dollars for members in obtaining changes in excise tax regulations and showed great activity through its Advertising Managers Council, which embraces publicity, advertising and sales executives of more than 130 companies, in the way of meetings, special conferences and bulletin service.

Germain Sees No Hitch Coming in Dunlop Plans

BUFFALO, Jan. 13—The expansion program of the Dunlop Tire & Rubber Corp. of America will go along without a hitch, Edward B. Germain, president of the company, said today in discussing the future of the mammoth River Road plant. Fully 10,000 persons, at least one-third of them women, will be employed in the plant when it is operating at peak production.

D. G. Snodgrass, general manager of British Dunlop, has come over to spend three or four months at the plant. There are also five other men here from England for inspection work. Germain's assistant at the plant is John L. Collyer, formerly with the Bethlehem Steel Corp.

Germain states that the plant will turn out only cord tires, refuting the rumor that fabric tires would also be produced.

In speaking of the sales policy of the company, Germain says:

We are not going to try to sell the whole 48 states at one time, but are going to reach out gradually from the Buffalo district. When we are satisfied that we have established our tires in one territory, we will step into another.

We shall not attempt to establish a nation-wide market until we have put our plant in such shape that it will handle any volume of sales. When we attain maximum production, our daily output will be 14,500 tires. Of these 1000 will be solid and 1000 giant. We expect to employ 2000 persons by next January.

Industry Abroad Is in Good Shape for Enlarged Sales of Automobiles During the Current Year

By J. D. MOONEY

Vice-president of the General Motors Corp. and President of the General Motors Export Co.

New York, Jan. 17.

THE picture before the export section of the automotive industry is that of a developing trade, with very definite increases in the volume of shipments certain for the coming year. Much progress already has been made in restoring normal business conditions throughout the world and this means that we may expect a demand for automobiles from nearly every section.

During 1922, sales progressed to more satisfactory levels but there were no overshipments and distributers and dealers were not forced to take any heavier commitments than were necessary for current sales. This means that the industry abroad is in good shape to go ahead this year to considerably enlarged sales.

We are apt to put too much stress and to think too much about the foreign complications featured in the headlines of the newspapers. From an office chair, basing our beliefs about business conditions in the foreign countries only from what we read in these "streamers," it is possible to imagine that the reparations situation has stopped trade everywhere outside of this country, or at least made it so difficult that we cannot afford to seek export outlets for our equipment.

This, of course, is an incorrect view, no matter what index figures and exchange quotations seem to indicate. The people in the various countries still have demands for food, clothing and shelter. To these demands has been added a fourth, that of transportation. Automobiles are required to supply some of this much needed transportation and, consequently, the demand for automotive vehicles has been developing along definite lines for the last ten years or more.

The extent to which any company will participate in our export trade will depend largely upon their own efforts to develop distribution and sales. There seems to be a general belief that there are no roads in any of the territories making up our chief buying sections but this also is incorrect. In South America, for instance, I found that there were more roads than automobiles. This, also, is true elsewhere. Our problem now is to put automobiles on the roads already built, knowing that the more automobiles in use the more roads will be built.

Passenger car prices for the buyers in other countries have been decreased materially and so, also, has the cost of operation and maintenance. Much progress has been made in this regard in the last few years and undoubtedly it will continue, the result being that automobiles will be available for an enlarging number of users.

Sales conditions look much brighter. Enlarged business seems assured and we must not overlook the important opportunities existing in the foreign field.

WISCONSIN LIBERTY RECEIVER

MILWAUKEE, Jan. 15—The Milwaukee Circuit Court has appointed the First Wisconsin Trust Co., Milwaukee, receiver of the Wisconsin assets and properties of the Liberty Motor Car Co., Detroit, on application of the Parish Manufacturing Co., Reading, Pa.

Rice Predicts Further Advances by Industry

NEW YORK, Jan. 15—Before leaving New York, following the closing of the show, H. H. Rice, president of the Cadillac Motor Car Co., declared that one would be a pessimist who could not look forward to further advances in the automobile industry in 1923. The future can be determined by three factors, he says—accomplishments of the industry itself, general business conditions and orders from distributing organizations.

In speaking of the outlook, Rice said:

Considering basic industries and general conditions as they affect the automotive industry, we can leap to the center of the situation by stating that orders for steel and iron placed with the big mills of the East by the motor car manufacturers indicate that they are expecting a record year.

As a result of the latest market analysis in which reports from the field and orders for months ahead have been factors, we have again had to revise our production schedule upward, as we have done time and again in the past twelve months. New men are being added to our manufacturing forces, new equipment is being installed.

Will Apply Used Car Plan in Truck Sales

N. A. C. C. to Attempt to Nationalize Boston Method—Caution Plate Revised

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5—Any special or extra fees levied upon motor vehicle common carriers should be utilized exclusively for highway maintenance. Such special or extra fees should in no case be more than 100 per cent greater than the normal registration fees for the vehicles of the class to which they belong.

7—Legislation should be enacted enabling steam railroads, trolleys and shipping companies to acquire, own and operate the motor vehicle in conjunction with their lines of business.

The new caution plate for trucks is designed to assist the different States at arriving at a sane and logical method of regulating loads and brakes. The plate reads as follows:

Reading of Plate

Maximum speed ... miles (this to be settled by State) per hour. Do not exceed. This vehicle, when tested at the factory showed a brake capacity which enabled the driver to stop it when loaded to its stated capacity and when running at its maximum stated speed in ... feet on a dry hard level road.

Note: Chassis weight includes complete chassis, front fenders, step, driver's seat, tools, lamps, horn, license brackets, normal quantity of fuel, lubricant and cooling mediums but without driver, body, auxiliary power devices or equipment.

A warning that overloading or overspeeding will void the warranty also is included, and the maximum weight must be given in pounds and include chassis, body, load and equipment, gross weight, front axle, gross, and rear axle, gross.

With electric vehicles the chassis weight includes running gear, motor, battery cradle, driving and control mechanism, wiring, housings, tools, lamps, horn, licensed brackets, charging plug and cable, but without driver, battery, body, auxiliary power devices or equipment.

Discussions at Conference

The discussions at the conference included four papers. "What's Wrong With the Motor Truck Industry?" was read by T. R. Lippard, president of the Stewart Motor Corp., with the discussion led by Robert O. Patten of Pierce-Arrow, F. G. Elder of Day-Elder, and M. Brearley of Autocar.

"How Can Manufacturers and Dealers Cooperate to Make Truck Paper More Attractive to Bankers?" was handled by Henry Farmer of Farmer & Ochs, with the discussion by David S. Ludlum of Autocar and M. L. Pulcher of Federal.

"Has a Terms Committee Such as That of the Piano Industry Been Successful in Establishing a Time Limit on Time Sales?" was presented by Kevie Jaffe, general counsel of the American Piano Co., with N. B. Burkness of Kleiber and Frank E. Smith of Republic leading the discussion.

"Best Methods for Finance Companies to Handle Truck Sales, Including the Length of Time Truck Paper Should Run," was the subject assigned J. H. Shale, formerly vice-president of the Bankers Commercial Security Co. of New York. A. L. Dean of General Motors Acceptance Corp. led the discussion.

HALL DRAWS PICTURES OF FARMER BUYER

CHICAGO, Jan. 13—A promising outlook for the farmer as a prospective buyer of manufactured commodities, including automobiles, this year was pictured by Guy H. Hall, director of the National Institute of Progressive Farming, in an address before the Chicago Business Editors' Association.

Hall recounted the progress made by the farmer in the last six months of 1922, as the prices of his products moved steadily upward and as his crops developed satisfactorily in quantity. He told of agitation from some quarters for the limitation of production as a means of artificially sustaining prices, but declared that fortunately such propaganda had not been favorably received by the farmers. Increased production and increased consumption of farm products are the elements of prosperity, he declared.

It was his opinion that within the next two months a vast amount of livestock will be marketed at profitable prices, and the farmers early in the season will have a considerable sum of money available for purchases. He referred to the fact that most farmers now consider the automobile a practical necessity.

Confidence Replaces Hope Felt Year Ago

(*Continued from page* 145)

rounded out the list of surprises with an output of 225,000.

A survey just completed by AUTOMOTIVE INDUSTRIES disclosed that for the year ended Dec. 31, 1922, there were registered in the United States 12,357,376 motor vehicles, which is an increase of 1,851,716, or 17.6 per cent. over the 1921 registration. The survey shows that there is one car to every 8.7 persons.

To meet the demand for cars which is apparent generally, plants are following high production schedules, which will be speeded up gradually as the year advances until it is expected that by March, peak capacity will be reached.

Show Drew Dealers and Factory Chiefs

Evidence of Keen Competition of Companies in Extending Representation

NEW YORK, Jan. 15—"A record show" best describes the twenty-third annual national automobile exhibition which closed Saturday night, according to close observers. The show apparently was generally satisfactory from the point of attendance, the volume of business transacted and the public interest stimulated.

As indicative of the record attendance of factory executives and dealers, the New York Central Railroad reports that during the seven day period, Jan. 2 to 8, its trains unloaded 48,624 Pullman passengers at Grand Central Terminal as compared with 40,800 during the seven corresponding days of last year. The Pullman travel was fully 20 per cent greater during this year's show week. The Twentieth Century from Chicago on Jan. 7 ran in five sections of twelve cars each for the first time in history.

It was evident to those who can successfully gage crowds that the show attracted as many visitors as last year's, if not more. Weather conditions worked against big crowds the first of the week, but from Wednesday on the public showed its interest by filling Grand Central Palace, where the show was held.

Dealers "Shopped Around"

Exhibitors reported more dealers present than at any previous show. As interpretive of this feature of the attendance, the expression was voiced that, in view of the close competition among the larger automobiles for wide representation, dealers came here to shop around. Nearly all producers are active in increasing their dealer representation.

It is doubtful if any previous show was attended by as many factory executives, company presidents bringing with them sales managers and chief engineers. As proof of this was the annual dinner of the National Automobile Chamber of Commerce, which attracted 900 representatives of affiliated companies, the greatest number ever being brought together on such an occasion. The Motor and Accessory Manufacturers Association's dinner drew more than 600.

AMES-HOLDEN REORGANIZED

MONTREAL, Jan. 15—A working agreement has been effected between the B. F. Goodrich Co. of Akron and the Ames-Holden Tire & Rubber Co., formerly the Ames-Holden Tire Co. of this city. The Goodrich company has acquired a substantial interest in the Canadian concern which has been reorganized. Some of the officials of Goodrich will serve on the board of directors of the Ames-Holden company.

Pamphlet Prepares Way for Law Making

Motor Vehicle Conference Committee Outlines Provisions It Regards Fair

NEW YORK, Jan. 15—Preparing for a flood of automobile legislation this year, when most of the State legislatures will be in session, the Motor Vehicle Conference Committee, representing the National Automobile Chamber of Commerce, Motor and Accessory Manufacturers Association, Rubber Association of America, National Automobile Dealers Association and American Automobile Association, has prepared a pamphlet for the use of its State sub-committees and for the legislators themselves which, it hopes, will be a guide for law-making that will be uniformly fair.

Realizing that it is necessary to impose size, weight and speed limitations upon motor vehicle use for the protection of the highway as well as vehicular and pedestrian movement, the committee believes that there is a happy medium between those two opposing factions, one of which claims that dimensions, weights and speeds of motor vehicles and their loads be reduced to the capacity of the weakest highway, and the other which insists that the roads be built to stand the biggest, heaviest and swiftest loads the users of motor vehicles desire to place upon the highways.

The committee makes the following suggestions:

Size Restrictions

1. Width, including load, 96 inches. (Traction Engine 108 inches.)
2. Height, including load, 12 feet 6 inches.
3. Length, including load:
   a. Single vehicle, 30 feet.
   b. Combination of vehicles, 85 feet.

NOTES—From the foregoing it is apparent that in order to admit of the safe passage of two vehicles each of which with its load is 96 inches wide, a highway at least 20 feet in width is desirable.

Weight Restrictions

1. Single vehicular unit of four wheels or less. (Tractors and semi-trailers to be regarded as separate units) ..... 28,000 pounds
2. Any one axle of the vehicle or any additional axles of semi-trailers or trailers.. 22,400 pounds
3. Per inch width of tire measured between flanges of the rim in case of solid rubber tires.

Size of Tire	Load Per Inch (Maximum)
3 in.	400 pounds
3½ in.	400 pounds
4 in.	500 pounds
5 in.	600 pounds
6 in.	700 pounds
7 in.	750 pounds
8 in.	800 pounds
10 in.	800 pounds
12 in.	800 pounds
14 in.	800 pounds

4. Minimum thickness of Rubber for solid rubber tires:

3 in.; 3½ in.; 4 in; 5 in. Tires	⅞ in.
6 in.; 7 in.; 8 in. Tires.....	1 in.
10 in.; 12 in.; 14 in. Tires.....	1⅛ in.

Speed Restrictions

In the matter of speed restrictions no motor vehicle should be operated upon a public highway at a rate of speed greater than is reasonable and proper, having regard to the traffic and use of the highway, or so as to endanger the life or limb of any person or the safety of any property, and should not in any event while upon an urban street run at a rate of speed greater than 15 miles per hour; upon a suburban street at a rate of speed greater than 20 miles per hour, or upon any other street or highway at a speed greater than 30 miles per hour.

NOTE.—The laws of many States and the proposed Uniform Vehicle Law prescribe for the three types of thoroughfares indicated a graduated schedule of speed limits based on the kind of tire equipment of the vehicle and its gross weight. Such elaborate and detailed schedules, however, are very difficult to enforce.

Special Permits to Raise Restrictions

There are, of course, times when it is imperative on certain highways or portions thereof that the movement of vehicles bigger and heavier than those allowed by law be permitted.

To meet such situations—which should be the rare exception rather than the rule—the State, county or municipality exercising jurisdiction over roads and bridges should be empowered under definite limitations to grant written permits for the movement of restricted vehicles to meet emergency conditions.

Special Permits to Lower Restrictions

To deal with bad frost or other similar conditions where it is essential to lower the weight or speed restrictions ordinarily enforced, the power of the State, as centralized in its highway departments or the county or local highway authorities, after consultation with and permission from the State Highway Department, should have power to reduce the weight or speed restrictions to points deemed essential to the preservation of highways or the safeguarding of travel.

In all such cases, however, there should be public hearings on the subject; due notice of the reduced restrictions should be given to the traveling public and the highways or portions thereof affected should be properly posted.

From the nature of the case, size restrictions on the vehicle of course can never be reduced.

Local Powers

Except as indicated, the subordinate political sub-divisions of the State, such as counties, cities, towns, boroughs, townships, etc., should have absolutely no power to prescribe size, weight or speed restrictions at variance with those allowed for the State as a whole. The need for such limitations on local governing bodies is too obvious to require discussion.

MIDWEST RUBBER TO ELECT

CHICAGO, Jan. 15—The fourth annual meeting of the Midwest Rubber Manufacturers Association will be held at the Hotel Morrison, Jan. 30, at 3 p.m. Directors will be elected. A banquet will be held in the evening. W. W. Wuchter of Omaha is president of the association, and C. S. Sutherland is general manager. Headquarters are in Chicago.

Argentina Promises to Beat Sales Marks

Farmers' Buying Power Comes Back Strong—Economic Expansion Predicted

BUENOS AIRES, ARGENTINA, Dec. 15 (*by mail*)—The present summer season is one of the best the automobile importers have ever had, and it is firmly believed that in 1923 Argentina will equal or break all previous records for the sale of American automobiles. Despite the plight of the cattle trades, the purchasing power of the farmers is coming back with a vengeance, and the country is in the midst of harvesting the largest grain crops ever produced here. Present indications are that all the surplus for export will be sold at remunerative prices. Sheep and hog farmers have nothing to worry about.

The business opinion here is that Argentina is on the threshold of a great economic expansion. Immigration is pouring into the country, and idle capital is being pressed into service. The new administration is strongly backed, and the extraordinary session of Congress is framing a budget that will cut expenses strictly to current revenues.

Loan to Be Arranged

It is probably only a matter of weeks until a large foreign and domestic loan is arranged to consolidate the national indebtedness. The bigger part of the foreign loan undoubtedly will come from New York, and the result should be further advances in the value of the peso, which even now is higher than it has been for three years and is within a few cents of par.

The Ford branch has increased its output to 80 vehicles daily and is about 1000 cars behind orders. Automobiles are coming in on every steamer, and every car importer is reporting quickened business. Trucks are moving more slowly, but certainly the interest in tractors is growing rapidly. The agricultural machinery houses are doing a huge trade, which is the case with practically every other line in contact with agriculture.

More Branches Dropped Under Winton's Policy

CLEVELAND, Jan. 15—The Winton Co., under the policy inaugurated early last year, announces the replacement of its direct factory branches in Pittsburgh and Seattle with dealer representation. The Pittsburgh territory formerly covered by the Winton branch has been taken over by C. J. Siors, who will operate under his own name. The Pioneer Auto Co. will represent the Seattle territory.

The Winton company originally had sixteen direct factory branches. Under the new merchandising policy of the present management, most of these have been closed and a distributor appointed.

FINANCIAL NOTES

Stutz Motor Car Co. of America is offering through Janney & Co., Frazier & Co. and Stroud & Co. of New York a new issue of $1,000,000 15 year, 7½ per cent convertible gold debenture bonds, due Oct. 1, 1937, at 100 and interest. Principal is payable April 1, 1937, at 100 and interest. Interest is payable April 1 and Oct. 1 without deduction of the normal Federal income tax up to 2 per cent. The Pennsylvania four mills tax is refunded. Bonds are convertible into stock of the company on the basis of 33 shares for each $1,000 bond.

Stover Signal Engineering Co., formerly of Cleveland, but for six months located in Racine, Wis., has reincorporated in Delaware, with a capital of $100,000 preferred and 16,000 shares of common stock without par value. The proportion to be used in Wisconsin is given as $50,000. Paul A. Stover, Baker block, Racine, is president and designated as Wisconsin agent of the foreign corporation, under its license in Wisconsin.

Fostoria Pressed Steel Co. has declared a 17½ per cent dividend on all preferred stock and a stock dividend of 25 per cent on common stock. Records of the company show that business increased during the year more than 50 per cent over the best preceding year, which was 1920. The company makes automobile fenders exclusively for replacements on 60 different makes of cars.

Seiberling Rubber Co. although having its tires in active sales for only nine months last year, reports 1922 sales reached $4,000,000. On the basis of 1923 business already booked, sales this year will reach and possibly exceed $9,000,000, according to president F. A. Seiberling.

Nash Motors Co. has declared a dividend of $2.50 a share on its common stock and the regular quarterly dividend of $1.75 a share on the preferred stock, both dividends payable Feb. 1 to stock of record Jan. 19.

H. H. Franklin Manufacturing Co. has declared the regularly quarterly dividend of 1¾ per cent on the company's cumulative preferred stock payable Feb. 1 to stockholders of record as of Jan. 20.

Duesenberg Automobile & Motors Co., Indianapolis, it is announced, will soon offer a new issue of first mortgage bonds in order to secure additional working capital.

Stromberg Carburetor Co. stockholders have ratified the increase in the authorized capital from 75,000 shares of no par capital stock to 130,000 shares.

Daniels Motor Co. directors have rescinded their action declaring a dividend of $2 per share on the preferred stock, payable Jan. 15.

White Motor Co. declared the regular quarterly dividend of $1 payable March 31 to stock of record March 20.

Durant Elizabeth Plant Dedicated by Officials

NEW YORK, Jan. 15—The formal dedication of the Durant plant at Elizabeth, N. J., was one of the events of show week. The dealers were taken to the plant on Tuesday and the next day the dedication took place, with leading officials of Durant Motors and its subsidiaries and many invited guests participating.

F. W. Hohensee, president and general manager of the Durant Motor Co. of New York and slated for the presidency of the New Jersey company, and W. C. Durant were guests of honor. Wednesday was the thirty-sixth anniversary of Hohensee's affiliation with Durant.

Among the guests were officials of all the Durant properties as well as prominent bankers and equipment manufacturers. The list includes:

H. W. Alger, C. S. Daly, Carroll Downes, W. W. Murphy, A. H. Farver, T. W. Warner and W. R. Willetts, Durant Motors directors; C. O. Miniger, Auto-Lite Co.; H. C. Tillotson, Tillotson carbureter; R. W. Judson and J. F. Dourquin, Continental Motors; C. A. Dana, Spicer, E. H. Broadwell, Fisk Tire; Earl Anthony, dealer on the Pacific Coast; J. T. Smith, General Leather Co.; D. H. Kelly, U. S. Light and Heat, and W. R. Smith, Warner Corp.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

Last week the tendency in the call money market was toward increased ease. Quotations ranged between 3½ per cent and 5 per cent, as compared with 3½ per cent to 5½ per cent in the preceding week. In the time money market trading was dull and no important transactions were recorded. The rates remained at 4½ per cent to 4¾ per cent for all maturities from sixty days to six months. The prime commercial rate continued to be quoted at 4½ per cent to 4¾ per cent, although most of the business was transacted at the higher rate.

The recent Treasury offering of $300,000,000 in 4½ per cent Treasury Notes maturing Dec. 15, 1927, has been oversubscribed by about $200,000,000. This heavy over-subscription is largely accounted for by the amount of funds demanding re-investment at the first of the year.

Revenue freight loadings for the week ending Dec. 30 totaled 711,200, which was a decrease of 123,391 cars from the preceding week, but an increase of 182,644 cars over the corresponding week in 1921 and 108,832 in 1920. Total loadings for 1922 were 43,713,509, a gain of 9.5 per cent over 1921, but a loss of 4.6 per cent., as compared with 1920, which was the record year in revenue freight loadings. Of the total, coal loadings in 1922 totaled 7,447,131 cars, as compared with 7,947,146 in 1921 and 10,082,271 in 1920.

The United States Steel Corp. reported unfilled tonnage on its books as of Dec. 31, 1922, amounting to 6,745,703 tons, a decrease of 94,539 tons, or 1.38 per cent from the total reported on Nov. 30, 1922. It was, however, an increase of 58 per cent over the amount of forward business on the books as of Dec. 31, 1921, but a decrease of 17.2 per cent from the total on Dec. 31, 1920. Steel ingot production in December amounted to 2,779,890 gross tons.

N. A. C. C. Completes Ad Meeting Program

Passenger Cars and Trucks to Be Discussed at Convention in Chicago

NEW YORK, Jan. 17—The program for the session of advertising men, called by the advertising committee of the National Automobile Chamber of Commerce, has been completed. The meeting will be presided over by Chairman E. S. Jordan and held at the University Club in Chicago Monday and Tuesday of show week.

The morning session on Monday will be devoted to passenger car subjects, including discussions on:

Distribution of Advertising Costs in Different Local Media Between Distributor and Factory.

How Can Consumer Media Be Tested?

How Can the Results of Dealers' Campaigns Be Tested?

How Can the Factory Help the Dealer Sell Used Cars by Advertising?

In the afternoon the discussions will concern themselves with house organs, export and advertising, what constitutes news and how can the N. A. C. C. and the respective advertising departments of the members be of increased helpfulness to each other.

Tuesday morning will be given over largely to the truck interests. In the morning the advertising men will talk on the division of advertising costs, checking national media, dealer helps and direct mail efforts, advertising of motor buses and house organs. In the afternoon one of the questions will be, Should company making a number of models advertise all in each piece of copy or plan a diversified campaign? There also will be a discussion of advertising media other than national consumer publications and a discussion on the best methods and uses of statistical research in relation to advertising.

VOGUE TRUSTEE NAMED

TOLEDO, Jan. 17—Judge George E. Schroth of Tiffin has been appointed trustee in bankruptcy for the Vogue Motors Co. of that place. At the meeting of creditors, in charge of Fordyce Belford, referee in bankruptcy, it developed that there were Federal tax claims of $5,000 and State tax claims of $2,000 which will almost absorb the proceeds of a sale of the plant.

ARMLEDER REORGANIZED

CINCINNATI, Jan. 17—The O. Armleder Co. has been reorganized as the O. Armleder Motor Truck Co. which has taken over its assets. Officers, stockholders and capitalization remain unchanged. Otto Armleder is president and general manager, and C. W. Steel will serve as secretary-treasurer of the reorganized company.

Belgium Conference on Tariff Dropped

Reason Given Is That Several Delegates Are Not Able to Be Present

PARIS, Jan. 1 (*by mail*)—Import duties will not be discussed during the annual show to be held in Brussels from Jan. 13 to 24, for the proposed meeting of the Bureau Permanent has been abandoned.

This organization, which is a grouping of national manufacturers' associations of all countries, excepting Germany, held its last meeting in London, when Belgium brought up the question of a reduction of import duties. Owing to the absence of several delegates, the subject could not be discussed and it was agreed to postpone the matter until the Brussels meeting.

Belgium and Italy Want Change

The reason given for the abandonment of the Brussels conference is that some of the delegates are unable to attend. It appears quite likely, however, that the meeting has not been called because France and England are anxious, at the present time, to avoid a discussion of the question of automobile import duties. Belgium and Italy, on the other hand, having a need for world's markets, are desirous of lowering the present high tariffs. Belgium is particularly anxious to bring about a change, and in order to put pressure on France to lower her 45 per cent duty, the Belgian government has introduced a bill into Parliament providing for increased duties into that country.

So far as the Bureau Permanent is concerned, the United States has maintained a neutral attitude. The National Automobile Chamber of Commerce sent C. C. Hanch as its delegate to one of the meetings of the bureau, but owing to misunderstandings there was no further intercourse between the American and European manufacturers. The impression appears to have got abroad that the American Automobile Chamber of Commerce would be called upon to pay dues on the basis of the number of men employed in the industry, and that it would be bound by all decisions of the European makers.

Misunderstanding Cleared

Secretary Cezanne states that it has never been proposed to ask America to pay dues on the basis of 5 cents per workman employed in the industry, but that the total dues for the United States would be 5000 francs per annum. Also, decisions taken by the bureau would not affect internal control in America unless approved by the delegates of that nation.

During their recent visit to Europe, H. H. Rice and Roy D. Chapin were in touch with the officials of the Bureau Permanent and attended some of their meetings in an informal capacity. It is believed, in European circles, that the report they presented to the N. A. C. C. on returning home will tend to remove the misunderstandings which have prevailed and will work toward cooperation between the American and European industry.

INDUSTRIAL NOTES

Wico Electric Co., manufacturer of batteries for motorcycles and magnetos for stationary engines, will move on March 1 to its new plant in West Springfield, Mass., where the first of five building units is nearing completion. As orders are far ahead of production, the force will be much increased and work will begin next spring on a second unit of 400 x 90 feet.

Wisconsin Metal Manufacturing Co., with plants in Chicago and at Prairie Farm, Wis., will consolidate its production in Chippewa Falls, Wis., and has leased a building which is being remodeled and re-equipped for manufacturing a diversified line of sheet metal goods, in copper, steel, iron and tin.

Traveler Rubber Co. reports that Jan. 15 it began the operation of another shift at its factory at Bethlehem and started on a twenty-four hour schedule. Business is reported to be increasing and prospects are exceedingly bright.

North Milwaukee (Wis.) Foundry Co., heretofore confining its attention to gray iron casting work, has acquired the entire equipment of the defunct Modern Steel Castings Co. of Milwaukee. This employs the converter process.

Perfection Windshield Co. of Indianapolis has moved its establishment to larger quarters. Steady growth of the business which has been extended to foreign countries is responsible for the move being made.

Canadian Exports Total $2,621,255 for November

WASHINGTON, Jan. 16—Automotive exports from Canada during November totaled $2,621,255, which represents a decrease of 2 per cent under the October exports, which were in turn an increase of 35 per cent over September.

Revised Canadian export figures, received by the United States Bureau of Foreign and Domestic Commerce show that 3587 passenger cars valued at $2,204,560 were shipped during November. This is a decrease of 3 per cent in number and 7 per cent in value for the month. Motor truck shipments were 428 in November, valued at $152,073 which is an increase of 70 per cent in number and 41 per cent in value. Parts exports decreased 9 per cent after an increase of 50 per cent in September.

ORGANIZE OTT RUBBER

DUBUQUE, IOWA, Jan. 15—The Ott Rubber Co., which will be capitalized at $300,000, has been organized here to manufacture rubber inner tubes for automobiles and other motor vehicles. The plant, which will be located in this city, will have an initial production of 2000 tubes daily.

METAL MARKETS

With first quarter orders of sufficient tonnage to relieve them of anxiety regarding operations during that period, steel producers are giving more and more thought to the new year's second quarter. Here and there mills have still sufficient gaps in their order books to make possible acceptance of business for February-March shipment, but, as a rule, it is sought to fill in these gaps with specifications that are especially attractive from a production point of view.

This is especially true of sheet mills. Far-sighted sales managers, however, are taking full advantage of the relatively brisk first quarter demand as a means of bringing home to consumers the wisdom of covering second quarter requirements as early as possible. For two years automotive buying of steel has been more or less of the hand-to-mouth variety and, with the outlook for prosperity in the automotive industries as bright as it appears at this time, steel producers are wondering whether conditions are not ripe for a change. Prices have attained sufficient stability to make much slighter the risk incurred by a buyer who has the courage to commit himself for more than a month ahead in his steel requirements.

Considerable of the business placed recently furnished indication that consumers are becoming more liberal in this direction. They recognize that if they would have steel products at fair prices and have them when they need them they must assume a reasonable amount of risk. That does not mean that the accumulation of heavy reserve stocks will again be countenanced, but simply that buyers will cooperate more than they did during the period of uncertainty that followed in the wake of the armistice in keeping steel output on a fairly even keel. Of course, if prices should perchance climb unduly, conservative buyers will again have recourse to hand-to-mouth buying to protect themselves against too sharp declines. For the time being, however, steadiness is the market's outstanding feature. Most of the first quarter business has been placed.

Pig Iron.—Middle West automotive foundries are gradually completing their first quarter's buying. In some centers prices have hardened. Very little thought has been given by melters so far to second quarter needs. Furnace interests assert that they are not over anxious for second quarter business, as the outlook with reference to the supply of fuel is too hazy. For all that, they are booking what little second quarter business comes their way.

Aluminum.—Reports were current a few days ago that the domestic producer had again advanced prices. The report met with denial, which, however, must be accepted in conjunction with the company's previous statements that it considered each order and inquiry upon its own merits and issued no general market price for publication. Most of the first half 1923 business has undoubtedly been placed. Sheets are quoted by importers at 35@35.50 cents, base, for shipment from abroad. For small warehouse lots premiums are asked and paid. Demand for ingots is light, but prices generally hold strong.

Copper—Producers are asking 14.75 cents for electrolytic, delivered. The recent buying movement has spent itself and the market now rules quiet, pending the coming of a new buying wave. Quite a large tonnage of the red metal is in speculative hands.

Calendar

SHOWS

Jan. 27-Feb. 3—Chicago, Annual Automobile Salon.

Jan. 27 - Feb. 3 — Chicago, National Automobile Show, under auspices of National Automobile Chamber of Commerce, Coliseum and First Regiment Armory.

FOREIGN SHOWS

Jan. 13-24 — Brussels, Sixteenth International Automobile and Cycle Exposition, Palais du Conquantenaire.

May 9 - June 12 — Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.

Oct. 4 - 10 — Paris. Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.

Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

RACES

May 10 — Berlin - Grunewald, German Grand Prix.

July 2 — Tours, French Grand Prix 500-mi. race.

CONVENTIONS

Jan. 29 - 31 — Chicago, Annual Meeting, Automobile Electric Service Association, Congress Hotel.

Feb. 8 - 9 — Chicago, City Club, Winter Sectional Meeting of the American Society for Steel Treating; W. H. Eisenman, 4600 Prospect Avenue, Cleveland, national secretary.

Feb. 15 - 16 — Chicago, National Association of Taxicab Owners, Hotel Sherman.

Feb. 19 - 20—Cleveland, Annual Convention of the National Highway Traffic Association.

April 25, 26 and 27—New Orleans, Annual Convention of the National Foreign Trade Council.

S. A. E. MEETINGS

Metropolitan Section

March 15—Speaker, William P. Kennedy, President, Kennedy Engineering Corp.; Subject, Trolley Buses and Flexible Vehicles for Street Railway Service.

April 19—Speaker, Edw. E. La Schum, General Superintendent, Motor Vehicle Equipment, American Railway Express Co.; Subject, Engineering Features of Fleet Operation.

May 17—Speaker, F. P. Gilligan, Secretary, Henry Souther Engineering Co., Subject, Metallic Materials for Automotive Work.

Other Meetings

Jan. 31 — Chicago Meeting and Dinner of the Society at the Congress Hotel.

Industry Is Third in Total Carloads

NEW YORK, Jan. 15—After compiling production statistics for 1922 and reporting on railroad shipments and other methods used to deliver the finished articles into the hands of the retailer, James S. Marvin, head of the traffic department of the National Automobile Chamber of Commerce, states that automobiles, trucks and parts, not including tires, rank third in the number of carloads—382,945 — of manufactured articles shipped on railroads in the first nine months of 1922. Refined petroleum with its products is first with 810,137 carloads; bar and sheet iron, structural iron and iron pipe are second with 482,424 and cement is fourth with 371,045.

Figuring on the full year, Marvin declares that the automobile industry's total will exceed 500,000 carloads.

Factory shipping figures for the year show that there were 331,226 carload shipments of automobiles as compared with 195,478 in 1921. Driveaways totaled 304,758 as against 144,446 in 1921, while boat shipments were 58,213 as compared with 22,310 in 1921.

Of the 2,576,219 motor cars and trucks made in 1922, 1,232,112 were Fords, while Ford's production in December aggregated 115,629 out of the month's count of 225,000.

The decrease of total production under November is 5 per cent; last year December decreased 35 per cent under November. The increase of December, 1922, over December, 1921, was 200 per cent.

New York District Sold 70,065 Cars Last Year

NEW YORK, Jan. 12.—The December analysis of sales in the metropolitan section as made by Sherlock & Arnold shows a total of 861 low and medium priced cars sold in that month, a decline from 3760 in November, and 145 higher priced cars, as against 512 in the previous month.

A recapitulation for 1922 gives the aggregate sales in the low and medium priced class as 63,162 compared with 42,831 in 1921, and in the higher priced class 6903 as against 4518 in the previous year. Total sales of all cars in 1922 were 70,065 and in 1921, 47,349.

In the low and medium priced class sales of only two cars during December were more than 100 and of only three others over fifty. The rest dropped well behind. In the higher priced class, ten sales of five makes of cars were reported. Sales of other makes were below that number.

The recapitulation for the year follows:

Month	Medium and Low Priced	Higher Priced
January	2,014	283
February	2,230	273
March	6,352	632
April	8,428	862
May	8,467	961
June	8,203	865
July	7,816	678
August	5,921	516
September	4,592	511
October	4,518	665
November	3,760	512
December	861	145
Total	63,162	6,903

Reo Deducts on Pay Day to Help Employees Save

LANSING, MICH., Jan. 15—The Reo Motor Car Co. has instituted an employees' saving plan whereby its workers will be helped to bank a part of their earnings each pay day. The plan is made possible by the cooperation of one of the Lansing banks following the signing of a card signifying the amount of money intended to save each pay day.

Reo deducts this from the regular pay of the employee and deposits it to the account of the worker once a month. The employee presents his pass book to have the amount of his savings written in. The time office of the company handles the banking for each employee from the time he declares his desire to put away a fixed figure regularly.

The only part the employee plays is to present his book monthly, thereby saving him frequent trips to the bank.

French Grand Prix Date Set for July 2

PARIS, Jan. 8 (*by mail*)—Monday, July 2, has been fixed for the French Grand Prix 500 mile road race for 122 cu. in. cars, to be run over a 14.2 mile triangular course located near the town of Tours.

Firms already entered for this race are Fiat, Rolland-Pilain, Sunbeam and Bugatti, each with three cars, and Voisin with a team of four cars. German firms are not admitted. Although the number of starters is not likely to be high, for it is not expected that many, if any, late entries will be received, the race promises to be keen by reason of the quality of the competitors.

After its success in the French and Italian races Grand Prix last year, Fiat naturally stands favorite. It is understood that this firm will make use of a new eight ahead engine of a more efficient type than the six which was used in 1922. The Italian drivers doubtless will be Pietro Bordino, Felice Nazzaro and Giaccone.

Sunbeam is working on a set of 122 cu. in. six-cylinder engines having a bore of 67 mm. Last year's design has been abandoned, the new engine having forged steel cylinders with welded on jackets, two valves per cylinder, and an extensive use of roller bearings.

Double Sleeve Valve Engine

Rolland-Pilain will race with the same eight-ahead as was used for the 1922 Grand Prix. Albert Guyot is captain of the team. Interest attaches to the Voisin entry by the decision to make use of a Knight type sleeve valve eight-cylinder engine. Gabriel Voisin declares that his racing cars will have a couple of four-cylinder standard engines coupled up to form an eight ahead, and that use will be made of as many standard parts as possible.

This is the first time in recent years that a double sleeve valve engine has been employed for a speed contest, and the venture therefore will be watched with interest.